

ORIGINAL ARTICLE

Probiotics Supplementation on Nutrient Digestibility in Captive Asiatic Elephants (*Elephas Maximus*) of Tamil Nadu State in India

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ABSTRACT

Probiotics are live microorganisms which have been found to confer a health on the host when administered in adequate amounts. This study was performed with the purpose of investigating effect of combinations of Probiotic preparation containing Genus *Lactobacillus* and Genus *Bifidobacterium* supplemented in temple elephants of Tamil Nadu. Before and after supplementation of probiotics, feed and dung samples were collected in 10 elephants, the dry matter digestibility was estimated by lignin as a internal marker. The same way the dry matter digestibility were calculated study elephants were supplemented with (n=10)1 gram of Probiotic preparation which contained 1×10^9 CFU of Genus *Lactobacillus* and 1×10^9 CFU of *Bifidobacterium* was given, orally per 50 kg body weight, through the food materials (concentrate feed), on a daily basis continuously for a period of ten days. On eleventh day the dung samples were collected from these ten elephants the dry matter digestibility calculated by lignin. The study elephants were divided in to two groups, elephants less than 14 years of age (n=4) were grouped as young elephants and elephants more than 14 years of age (n=5) were grouped as adult elephants, to reveal the per cent improvement of dry matter digestibility pertaining to the Probiotics supplementation. The dry matter digestibility before and after administration of probiotics was determined and differences in dry matter digestibility were calculated. The results data were statistically analyzed by using Students' T test. Over all Mean \pm S.E. of dry matter digestibility in temple elephants before and after probiotics administration were 31.89 \pm 2.87 per cent and 42.65 \pm 2.55 per cent respectively. Dry matter digestibility values in per cent before and after the supplementation of Probiotic preparations were statistically highly significant variations ($P \leq 0.01$). Mean \pm S.E. of dry matter digestibility in young and adult temple elephants groups before and after probiotics administration were 18.49 \pm 4.18 per cent and 6.82 \pm 1.40 per cent respectively. Subsequent to the supplementation of Probiotics preparations, the dry matter digestibility between young elephant (n=4) group and adult elephant (n=5) group revealed statistically significant variations ($P \leq 0.05$).

Keywords: dry matter digestibility, asian elephants, probiotics

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INTRODUCTION

In order to increase the improvement on nutrient conversion, researches are conducted on the feeding technology using new generation probiotics. Generally, probiotics group of non pathogen microorganisms that have positive effect on physiology and health of gastro intestinal tract of its host if regularly consumed in sufficient quantities [1-2] [3] Probiotics have been incorporated through diets, with the objective to keep intestinal microbiota balance of animals, preventing digestive tract diseases, improving feed digestibility, leading to a greater use of nutrients and improving animal performance³. Multi-strain or multi-species probiotics have been found to have more effective and consistent functionality than mono-strain or single-species probiotics [4]. Microorganisms producing lactic acid, such as *Lactobacilli Sp.*, *Bifidobacteria Sp.*, *Streptococcus Sp.*, *Pediococcus Sp.*, as well as yeast and

filamentary fungi are commonly used as probiotic preparations [5]. The current study was carried out to evaluate the effects of combinations of Probiotic preparation containing Genus *Lactobacillus* and Genus *Bifidobacterium* supplemented for digestibility of nutrients in Asian temple elephants of Tamil Nadu.

MATERIALS AND METHODS

Feed (concentrate feed and fodder) and dung samples were collected from each study temple elephant (Tiruchendur, Erattaitirupathi, Tirunelveli, Tirukkurugudi, Ilanji, Tiruvanaikovil, Tiruvaiyaru, Tiruvadamarthur, Tirunageswaram and Mannargudi) for this study continuously for three days and representative feed and dung sample (n=10) for each elephant was obtained from their respective pooled feed and dung samples. Samples were subjected to the estimation of moisture and lignin [6]. Using lignin content as an internal marker, the digestibility on dry matter basis was calculated in per cent. Before supplementation of probiotics the dry matter digestibility were calculated after these study elephants were supplemented with (n=10), 1 gram of Probiotic preparation which contained 1×10^9 CFU of Genus *Lactobacillus* and 1×10^9 CFU of *Bifidobacterium* (Plate 1) was given, orally per 50 kg body weight, through the food materials (concentrate feed-Plate 2), on a daily basis continuously for a period of ten days. On eleventh day the dung samples were collected from these ten elephants for calculating the dry matter digestibility using lignin as an internal marker. With regard to the grouping of elephants, however only 9 temple elephants were associated and accordingly, elephants less than 14 years of age (n=4) were grouped as young elephants and elephants more than 14 years of age (n=5) were grouped as adult elephants, [7] in order to reveal the per cent improvement of dry matter digestibility pertaining to the Probiotics supplementation. The dry matter digestibility before and after administration of probiotics was determined and differences in dry matter digestibility were calculated. The result data were statistically analyzed by using Students' T test as per the standard procedures [8].

RESULTS AND DISCUSSION

Over all Mean \pm S.E. of dry matter digestibility in temple elephants before and after probiotics administration were 31.89 ± 2.87 per cent and 42.65 ± 2.55 per cent respectively (Table 1 and Figure 1). Dry matter digestibility values in per cent before and after the supplementation of Probiotic preparations were statistically highly significant variations ($P \leq 0.01$). Similar to the present study, the earlier workers were observed that administration of probiotics increased digestibility of dry matter, organic matter and crude protein [9-11]. Moreover, others have reported the similar effects the administration of probiotics enhancement of peristalsis, healthy microbial balance within the intestine, assimilation of different nutrients, in addition to providing of B vitamins, improved digestibility, regularity and re-absorption of proteins, fats and carbohydrates and improvement in the feed-efficiency [12-15].

Mean \pm S.E. of dry matter digestibility in young and adult temple elephants groups before and after probiotics administration were 18.49 ± 4.18 per cent and 6.82 ± 1.40 per cent respectively (Table 2 and Figure 1). Subsequent to the supplementation of Probiotics preparations, the dry matter digestibility between young (n=4) group and adult elephant (n=5) groups revealed statistically significant variations ($P \leq 0.05$). The significant variations ($P \leq 0.05$) observed between the selected age groups (Table 2) might be attributed to the change in metabolic events of the body pertaining to the age factor, variations in health status, feed composition of the feed materials offered, variations in the immunity level, type of probiotic microorganism; method and administered amount; host condition; intestinal microbiota condition etc.

Subsequent to the administration of Probiotics preparations, the dry matter digestibility in per cent were (Table 1 and Figure 1) increased in all these ten elephants except in one elephant. Reasons for the absence of enhancement of dry matter digestibility in one elephant might be attributed to the factors like probable concurrent administration of antibiotic, concurrent existence of other disease causing pathogens, altered metabolic status of the individual due to multifaceted reasons etc.

The selection of Genus *Lactobacillus* as the component of the Probiotic preparations that were offered to the temple elephants through the concentrate feed materials in this study programme carried out was in agreement with the findings furnished by earlier worker who opined that oral administration of *Lactobacilli* inhibited the growth of *Salmonella enteritidis* and would also reduce the *Salmonella enteritidis* in the intestinal segments, possibly resulting in the reduced systemic infections [16].

The administration of the Probiotic leading to overall enhanced dry matter digestibility in the elephants under study led to the conclusion that the elephants esp. with the low digestibility shall be supplemented with the Probiotic preparations containing Genus *Lactobacillus* as well as *Bifidobacterium*. This is indirectly supported by the earlier report who reported that the Asian elephants retained food longer in the digestive tract longer, relative to the body size and thus could achieve higher digestibility coefficient, when compared to the case with African elephants due to the ecological adaptations for the divergent

dietary strategies and however, all the elephants were generally found to have a low apparent digestibility [17]. Hence, it might be highly beneficial to provide the supplementation of Probiotic preparations in elephants esp. with low digestibility. Hence, the Probiotic preparation used in this study with the elephants that were reared in various temples of Tamil Nadu state is to be considered as more significant esp. in the captive elephants. The existence of highly significant variations ($P \leq 0.01$) of the dry matter digestibility in per cent during comparison of the values prior and after the administration of Probiotics (Table 1) might also be attributed to the beneficial effects of Probiotic organism-*Bifidobacterium* which was quoted to be a stimulant of the immune response and further, these organisms are associated with the effective reduction of growth of many potential pathogens as well as the prevention of diarrhoea and constipation, in addition to the improved intestinal functions.

Table-1 Dry matter Digestibility of temple elephants (n=10) before and after Probiotics supplementation

Elephant No.	Age (Years)	Body weight (kg)	Ration fed	Digestibility Before probiotic supplementation	Digestibility After probiotic supplementation	Percent difference
1.	11	1550	Rice-4kg, Horse gram-1kg, Nanal grass + Banyan tree leaves-125kg	36.85	54.84	17.99
2.	41	4600	Rice-10 kg, Nanal grass+ Coconut tree leaves-150kg	34.59	43.71	9.12
3.	15	3800	Rice-10 kg, Horse gram 2kg,Greengram-2kg Nanal grass+ CO3 grass+ Banyan tree leaves-250 kg	33.94	37.24	3.30
4.	54	3750	Rice-7kg,Ragi-1kg Nanal grass +Peepal tree leaves Banyan tree leaves-200kg	37.60	37.14	-0.46
5.	25	4240	Rice-10kg, Nanal grass + Peepal tree leaves Banyan tree leaves + Jampu tree leaves+ Coconut tree leaves -200kg	23.44	31.30	7.86
6.	12	2650	White flaked rice-5kg,Milk- 2.5 litre,Rice-6kg,Horse gram-3kg Banyan tree leaves + Coconut tree leaves 250k	21.34	51.16	29.82
7.	8	2650	Rice-4kg,Ragi-4kg Nanal grass +Sorghum fodders- 250kg	16.17	32.56	16.39
8.	39	4600	Rice-5kg,White Horsegram-1kg Nanal grass+ Banyan tree leaves-120kg	47.00	50.72	3.72
9.	10	2785	Rice-4kg,Brown flaked rice- 4kg,Dates-3kg,Green gram- 2kg,Ragi-2kg Nanal grass + Peepal tree leaves Banyan tree leaves+Coconut tree leaves200k	35.40	45.14	9.74
10.	15	3250	Rice-6kg,Green gram2kg,Ragi-2kg Nanal grass + Peepal tree leaves Banyan tree leaves +Coconut tree leaves 175kg	32.58	42.70	10.12
			Mean ± S.E	31.89 ± 2.87	42.65 ± 2.55	

Paired t-test

Before			After		t - Test	P - Value	RESULT
N	MEAN	±SE	MEAN(Y)	±SE(Y)			
10	31.89	2.87	42.65	2.55	3.88	0.0037	**

Statistically highly significant ($P \leq 0.01$)

Table- 2 Per cent Dry matter Digestibility improvement in Temple elephants (n=9) subsequent to Probiotics supplementation between age groups

Less than 14 years group	Per cent - improvement
1	17.99
2	29.82
3	16.39
4	9.74
Mean	18.49
S.E.	4.18
More than 14 years group	Per cent - improvement
1	9.12
2	3.3
3	7.86
4	3.72
5	10.12
Mean	6.82
S.E.	1.40
"t" test	2.92
"p" value	0.0225*
Results	$P \leq 0.05$

Statistically significant ($P \leq 0.05$)

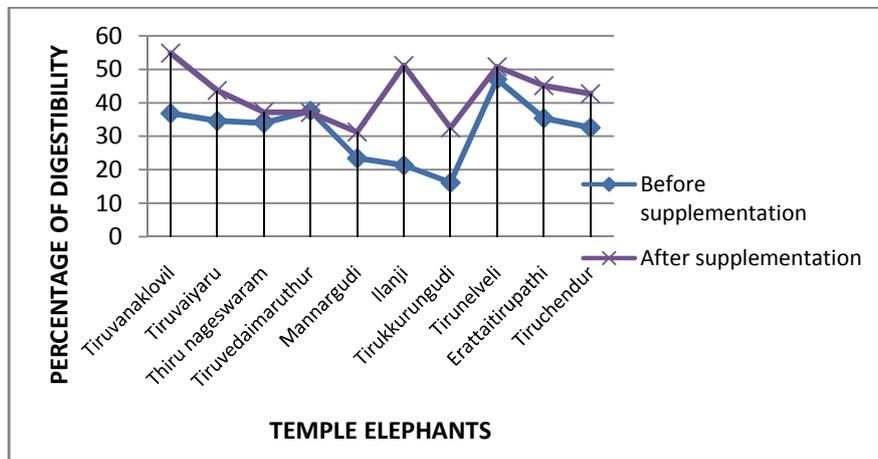


Figure-1 Comparison of Digestibility in per cent on dry matter basis before and after Probiotic supplementation



Plate 1 Probiotic supplements



Plate 2 Probiotic supplements mixed with feed materials

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