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Study the Efficacy of Herbal Digestive Tonic in supporting Dairy Cows Rumen Functions and Digestive Performances

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Abstract:
This study investigated the effectiveness of Herbal Digestive Tonic (HDT) in supporting rumen functions and digestive performance in dairy cows. Twenty-six dairy cows were supplemented with HDT at 10g/cow/day for three days. Parameters such as appetence, rumen motility, salivation, feed intake, and activity level were assessed before and during supplementation. The results showed that appetence and rumen motility improved significantly on day 1 and day 2, respectively. Salivation and feeding intake scores also increased significantly on day 2. Activity level scores improved on day 2 as well. The study concluded that HDT supplementation can support to enhance appetence, rumen functions, salivation, and feed intake in dairy cows. The product performance and satisfaction score, as reported by end-users, was 2.92 ± 0.69. These findings have important implications for developing sustainable and efficient farming practices in ruminant production. Overall, HDT shows promise as a supportive supplement for dairy cows.

I. INTRODUCTION

The global demand for high-quality proteins is on the rise, and ruminant livestock production plays a vital role in meeting this need while ensuring food security and safety[1]. Animal products like meat, milk, and eggs are rich in high-biological value proteins, essential amino acids, and crucial nutrients like heme-iron, vitamin B12, and calcium[2-3]. However, maintaining optimal digestion is fundamental to the health and well-being of all animal species.

Proper digestion is the cornerstone of animal health, and feed digestibility and assimilation are critical factors in farm profitability. Feed costs can account for up to 70% of a livestock enterprise's expenses, making it essential to optimize feed utilization[4]. Unfortunately, farm animals often suffer from digestive issues like ruminal stasis, flatulence, indigestion, anorexia, and impaction, which can impact productivity and overall health[5].

Improving rumen fermentation efficiency has long been a valuable strategy for boosting livestock production performance. However, it's crucial to consider the environmental implications of such strategies, as they can influence the production of waste products like methane, a potent greenhouse gas. In response, researchers have been exploring the use of safer, herbal feed additives that can modulate the rumen and enhance ruminant productivity without harming the environment[6].

Herbal feed additives, rich in plant secondary phytochemicals, have shown promise in protecting animals from predators, pathogens, and environmental stress. Utilizing biologically active compounds as feed additives offers a practical, cost-effective, and scientifically robust approach to achieving sustainable and efficient agricultural practices. Certain herbs and spices, such as cinnamon, oregano, thyme, ginger, garlic, and cumin, have been found to possess health benefits, including stimulating appetite, digestion, and immunity[7].

Ginger (Zingiber officinale) and garlic (Allium sativum) are two herbs that have been extensively studied for their beneficial properties[8,9]. Ginger is valued for its digestive and anti-inflammatory effects, while garlic contains compounds like allicin, ajoene, and diallyl sulfide, which exhibit antibacterial, anti-inflammatory, and antiparasitic properties[10,11]. Cumin (Cuminum cyminum) has also been used as a feed additive to improve nutrient utilization and production efficiency in animals[12].

With this background, the Himalaya Wellness Company, India, formulated "Herbal Digestive Tonic" (HDT), in R&D. This in-vivo study aimed to evaluate the efficacy of HDT in enhancing rumen functions and digestive performance in dairy cows, ultimately assessing its effectiveness in the target species for specified indications.

II. MATERIALS AND METHODS

HDT

Rumitonic Gel™ is a proprietary HDT formulation developed by Himalaya Wellness Company, Bengaluru, India. HDT is composed of herbs namely *Zingiber officinale* (Zinger), *Allium sativum* (Garlic), and *Cuminum cyminum* (Cumin) and fortified with nutrients like Vitamin B_{12} and cobalt.

Ethical Approval

Use of animals for this study was approved by Committee for Control and Supervision of Experiments on Animals (CCSEA), Protocol No. AHP/LA/13/23.

Experimental Animals

A total of 26 multiparous dairy cows of *Holstein Friesian* and Jersey cross breeds aged between 1.0-10.0 years in their 1-6 lactation periods at Devanahalli town, Bengaluru rural district, Karnataka were selected. The animals with appetite disturbances, not having food, rumination, and salivation disturbances were included in the study. Dairy cows suffering from milk fever, downer cases; with history of ascites & fatty liver syndrome; with absence of gag reflex and dairy cows with severe disease conditions like TB, metritis, prolapse etc, were excluded from the study.

Study Design and Experimental Details:

A total of 26 multiparous dairy cows were selected and supplemented with HDT at 10g/cow/day for three consecutive days. The quantity of HDT supplementation was selected as per the label recommendation and is also the intended usage for the target species for specified indications. When HDT is being supplemented to the dairy cows, concurrent supplementation with other rumen parameters & salivation enhancing, and appetizer actions-based products were not followed.

Animal Husbandry

Animals were managed by the farmers and housed under standard conditions at farmer's site. The regular feed *viz.* concentrated feed (approx. 10kg/day/cow) and roughages (approx. 34 kg/day/cow) were offered. The drinking water was made available *ab libitum.*

Assessment Parameters

The assessment parameters *viz.* appetence, rumen motility, salivation, feed intake, and activity level were assessed before supplementation of HDT (baseline) and three consecutive days after supplementation of HDT as described in Table 1. Furthermore, feedback on the performance/satisfaction of usage of HDT for the improvement of rumen functions and digestive performance was collected from farmers and field veterinarians as described in Table 1 and recorded in raw data sheet.

Table 1. Assessment parameters grading system

Parameters	Description	Score
A. Appetence score	Normal - Restoration of appetence	3
	Mild Inappetence – 50% offfeed	2
	Inappetence - Offfeed	1
B. Rumen motility score	Normal – 2-5 contractions per 2 minutes	3
	Hypermotility – >5 contractions per 2 minutes	2
	Hypomotility – <2 contractions per 2 minutes	2
	Ruminal stasis – No motility	1
C. Salivation score	Normal salivation	3
	Average salivation	2
	Poor salivation	1
D. Feed Intake score	Normal – Takes full feed	4
	Mild Anorexia – Takes 50% feed	3
	Moderate Anorexia – Takes 25% feed	2
	Severe Anorexia – Takes no feed	1
E. Activity level score	Normal - Active and alert	3
	Dull and depressed	2
	Sluggish and Lethargy	1
F. Product performance / Satisfaction score	Highly Satisfied	4
	Moderately Satisfied	3
	Neither satisfied nor dissatisfied (Ambiguity)	2
	Not Satisfied (No relief)	1

Statistical Analysis

The data are expressed as Mean ± standard deviation (SD). Data was subjected to statistical analysis using Repeated Measures one-way ANOVA followed by Dunnett's multiple comparison *post-hoc* test to draw a

comparison between before supplementation of HDT (baseline) and three consecutive days after the supplementation of HDT *i.e.*, day 1, day 2, and day 3. $p \leq 0.05$ was considered statistically significant.

III. RESULTS

The appetence and rumen motility scores were significantly increased as early as day 1 ($p<0.05$) and day 2 ($p<0.001$) supplementation of HDT respectively as compared to baseline. The appetence score and rumen motility score (mean± SD) exhibited on baseline, day 1, day 2, and day 3 was 1.65 ± 0.49, 1.88 ± 0.43, 2.35 ± 0.63, and 2.73 ± 0.45 and 1.81 ± 0.40, 1.96 ± 0.34, 2.58 ± 0.50, and 2.85 ± 0.37 respectively (Table 2).

Table 2. Effect of HDT on appetence and rumen motility score in dairy cows

Parameters	Baseline	Day 1	Day 2	Day 3
Appetence score	1.65 ± 0.49	1.88 ± 0.43	2.35 ± 0.63	2.73 ± 0.45
Rumen motility score	1.81 ± 0.40	1.96 ± 0.34	2.58 ± 0.50	2.85 ± 0.37

Values are expressed as Mean ± SD; n=26
$p<0.05$ and $p<0.001$ as compared to baseline based on Repeated Measures One-way ANOVA followed by Dunnett's multiple comparison *post-hoc* test

There was a statistically significant ($p<0.01$) improvement in salivation score and feed intake score was observed as early as day 2 supplementation of HDT as compared to baseline. The salivation score and feed intake score (mean ± SD) exhibited by animals on baseline, day 1, day 2, and day 3 was 1.77 ± 0.65, 2.08 ± 0.69, 2.46 ± 0.71, and 2.77 ± 0.65 and 1.81 ± 0.57, 2.27 ± 0.67, 2.73 ± 0.60, and 3.38 ± 0.70 respectively (Table 3).

Table 3. Effect of HDT on salivation and feed intake score in dairy cows

Parameters	Baseline	Day 1	Day 2	Day 3
Salivation score	1.77 ± 0.65	2.08 ± 0.69	2.46 ± 0.71	2.77 ± 0.65
Feed Intake score	1.81 ± 0.57	2.27 ± 0.67	2.73 ± 0.60	3.38 ± 0.70

Values are expressed as Mean ± SD; n=26
$p<0.01$ and $p<0.001$ as compared to baseline based on Repeated Measures One-way ANOVA followed by Dunnett's multiple comparison *post-hoc* test

The activity level score was significantly ($p<0.001$) improved as early as day 2 supplementation of HDT as compared to baseline. The activity level score (mean± SD) exhibited by animals on baseline, day 1, day 2, and day 3 was found to be 1.81 ± 0.57, 1.92 ± 0.56, 2.58 ± 0.64, and 2.69 ± 0.55 respectively (Table 4).

Table 4. Effect of HDT on activity level score in dairy cows

Parameter	Baseline	Day 1	Day 2	Day 3
Activity level score	1.81 ± 0.57	1.92 ± 0.56	2.58 ± 0.64	2.69 ± 0.55

Values are expressed as Mean ± SD; n=26

$p<0.001$ as compared to baseline based on Repeated Measures One-way ANOVA followed by Dunnett's multiple comparison *post-hoc* test

Product performance/product satisfaction score (mean± SD) exhibited by dairy cows following supplementation of HDT was found to be 2.92 ± 0.69 (Table 5).

Table 5. Effect of HDT on product performance score in dairy cows

Parameters	Score
Product performance / Product satisfaction	2.92 ± 0.69

Values are expressed as Mean ± SD; n=26

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IV. DISCUSSION

The use of feed additives has become increasingly popular in the quest to improve the quality of animal feed and the overall health and performance of livestock. Scientists have been exploring the potential of various plant or herbal extracts as feed ingredients to enhance animal fitness and productivity.[13] Notably, herbs such as turmeric, yucca, ginger, garlic, cinnamon, and others have been investigated for their beneficial effects on animal health. The study focused on evaluating the efficacy of a herbal feed supplement, HDT, which comprises a combination of potent herbs, including *Zingiber officinale*, *Allium sativum*, and *Cuminum cyminum*.[14,15]

The results of the in-vivo study revealed that supplementation with HDT for three consecutive days had a profound impact on the rumen functions and digestive performances of dairy cows. Specifically, we observed a restoration of normal appetence and rumen motility, improved salivation, and increased intake in the animals.

The benefits of HDT can be attributed to the synergistic effects of its constituent herbs. *Allium sativum*, for instance, has been shown to improve digestive functions both directly and indirectly. Directly, it exerts stomachic, anti-methanogenic, carminative, and appetizer effects, while its oil enhances fiber digestibility in the rumen. Indirectly, it modulates the microbiome to improve feed utilization.[16,17] Similarly, *Zingiber officinale* has been reported to stimulate rumen and gastric functions, enhancing palatability, digestive enzyme secretions, and overall nutrient utilization efficiency.[18-20]

The combination of *Allium sativum* and *Zingiber officinale* appears to have a complementary effect, resulting in optimum bacterial[22] count and improved performance in ruminant animals. Moreover, *Cuminum cyminum*, which is rich in unsaturated fatty acids and secondary metabolites, has been shown to increase digestibility of nutrients and enhance nutrient utilization.[21]

The antioxidant activities of *Allium sativum* and *Zingiber officinale* may also play a crucial role in maintaining rumen efficiency. Antioxidant compounds can ameliorate the toxic effects of excessive unsaturated fatty acids in the rumen, which can accumulate and cause irregular microbial digestion.[23-28]

This study demonstrated that supplementation with HDT can help to recover animals from a dull and depressed state to an active and alert state within a short period. These findings can be attributed to support the overall improvement in appetence, rumen functions, augmentation in salivation, and feed intake of animals following HDT supplementation. The results of the study have implications for the use of HDT as a feed additive in dairy cow nutrition.

V. CONCLUSION

In conclusion, the study provides evidence for the efficacy of HDT in enhancing rumen functions and digestive performances in dairy cows. The synergistic effects of its constituent herbs, including *Allium sativum*,

Zingiber officinale, and *Cuminum cyminum*, make HDT a promising feed additive for improving animal health and productivity.

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