



Assessing the Effectiveness of a Polyherbal Iron Tonic (pHIT) Supplement in Supporting Cattle Health: A Study on Anaemia Alleviation and Overall Well-being

Rajesh M¹, Bhagwat VG^{2*} and Varun Kumar K²

¹Senior Veterinary Officer, Veterinary Dispensary, Tindlu, Devanahalli, Bengaluru, Karnataka, India

²Senior Principal Scientist, Himalaya Wellness Company, Makali, Bengaluru, Karnataka, India

***Corresponding Author:** Bhagwat VG, Senior Principal Scientist, Himalaya Wellness Company, Makali, Bengaluru, Karnataka, India.

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Abstract

Anaemia caused by haemoprotozoan infections is a significant challenge for dairy cow health, leading to reduced productivity and compromised well-being. To address this issue, we investigated the effectiveness of a Polyherbal Iron Tonic (pHIT) supplement in alleviating anaemia and enhancing overall health in lactating dairy cows. Ten multiparous cows received 100mL of pHIT daily for 10 days, and their progress was closely monitored using the FAMACHA score, rumen motility, feed intake, and activity levels. Remarkably, the FAMACHA score showed significant improvement within just six days of pHIT supplementation, with the cows' anaemic state easing from severe to mild by day 10. Furthermore, we observed notable improvements in the cows' overall health, including increased feed intake and enhanced rumen motility, throughout the 10-day supplementation period. Our findings suggest that pHIT is a valuable tool for dairy farmers to help mitigate anaemia and promote the well-being of their animals. By positively influencing feed intake and rumen motility, pHIT supplementation can help reduce production losses and support the health and productivity of dairy cows.

Keywords: pHIT; Anaemia; Dairy Cow; Haemoprotozoan; Supplementation

Abbreviations

pHIT: Polyherbal Iron Tonic

Introduction

Dairy farming, a cornerstone of animal husbandry, relies heavily on the health and welfare of its bovine population, making it essential to prioritize their care and well-being. In fact, many farmers consider animal health to be the most critical aspect of animal welfare, and measures to promote animal health can help identify the overall welfare status of a herd [1,2]. The global livestock industry significantly contributes to agricultural production, with livestock products accounting for almost half of the total value [3]. The increasing demand for animal-sourced foods, driven by population

growth and rising incomes, is expected to lead to a 63% increase in global demand for meat and a 30% increase in demand for milk products by 2050 [6,7]. Iron deficiency anemia is a prevalent disease in calves, primarily caused by an inadequate supply of iron during exclusive milk feeding without additional dietary supplements [8]. Cow's milk contains approximately 0.5 mg/kg of iron, which is insufficient to meet the calf's iron requirements [9]. Dairy cows are susceptible to a range of health issues, including chronic blood loss due to gastrointestinal ulcers, parasitic infestations, hemorrhagic diseases, and malnutrition, all of which can contribute to iron deficiency [10,11]. This deficiency can have far-reaching consequences, including stunted growth, loss of appetite, and increased infection rates in calves [12].

Haemoprotzoan infections, caused by parasitic protozoans like Theileria, Babesia, and Anaplasma, pose a significant threat to the health and productivity of dairy cows [13-19]. These infections can manifest in severe clinical signs, including fever, anorexia, anaemia, and even death [20]. The economic toll of these infections is staggering, with estimated annual losses of \$18.7 billion globally and \$498.7 million in India alone [13,14].

Recent studies have shed light on the potential of plant secondary metabolites, or phytochemicals, to revolutionize ruminant nutrition, influence ruminal fermentation, and exhibit antibacterial properties [21]. The use of phytochemicals to bolster the health, immunity, and metabolic status of postpartum cows has emerged as a promising area of research [22,23]. Herbal extracts rich in phytobiotics have shown promise in improving the metabolic status of dairy cows [24].

Against this backdrop, present study aimed to evaluate the effectiveness of oral supplementation with a Polyherbal Iron Tonic (pHIT) support in alleviating anaemia caused by haemoprotzoan infections and improving the overall health of dairy cows. By exploring the potential of pHIT as a sustainable solution, this study hope to provide dairy farmers with a valuable tool to address the challenges posed by haemoprotzoan infections and iron deficiency anaemia.

Materials and Methods

Polyherbal Iron Tonic (pHIT)

Haemotec™ liquid is a polyherbal iron tonic (pHIT) developed by Himalaya Wellness Company, Bengaluru, India. It is mainly composed of herbs namely *Azadirachta indica*, *Andrographis paniculata*, *Cichorium intybus*, and *Zingiber officinale* fortified with ferrous and cobalt.

Experimental animals

Ten lactating dairy cows, comprising Holstein Friesian cross (HFx) and Jersey cross breeds, aged between 2.8 and 7.0 years, were carefully selected from three to five different owners in Devanahalli taluk, Bengaluru rural district, Karnataka, for this study. The selection criteria included lactating dairy cows with anemic

condition, nutritional deficiencies, poor body condition scores, and appetite disturbances. Conversely, cows with a history of sub-clinical or clinical mastitis, ascites, fatty liver syndrome, foot-and-mouth disease, or other severe disease conditions such as tuberculosis, metritis, or prolapses were excluded from the study.

Experimental design

The 10 selected lactating dairy cows were supplemented with a Polyherbal Iron Tonic (pHIT) at a 100 mL once daily for 10 consecutive days, either through their daily feed or drinking water. The quantity of pHIT supplemented was based on the label recommendations and intended use for the target species. During the study period, no concurrent supplementation with herbs or other herbal-based products containing ferrous content was provided.

Assessment of anemic conditions

The efficacy of pHIT supplementation in alleviating anemic conditions in dairy cows was evaluated by a veterinarian using the FAMACHA score card (Figure 1) [25]. The FAMACHA score is a standardized system that assesses the color of the ocular conjunctiva, ranging from 1 to 5, where: score 1 = red (non-anemic); score 2 = red pink (non-anemic); score 3 = pink (mildly anemic); score 4 = pink white (anemic); and score 5 = white (severely anemic). This scoring system allows for quick and accurate assessment of anemia in dairy cows.

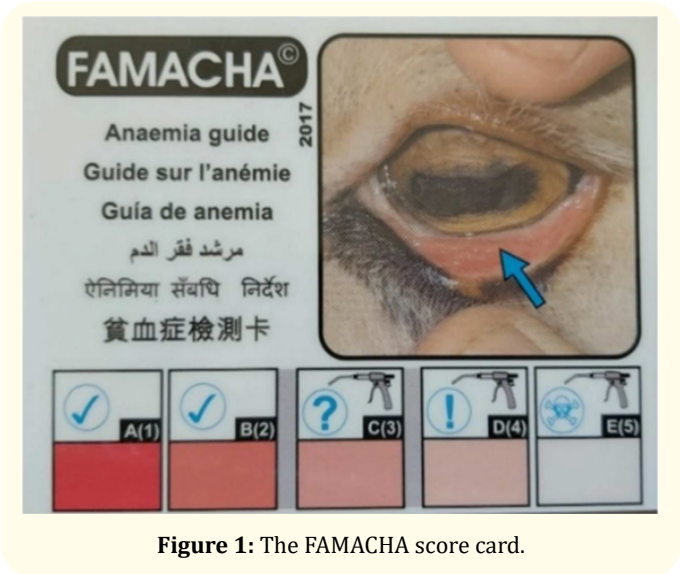


Figure 1: The FAMACHA score card.

General health assessment

The assessment parameters of general health parameters viz. rumen motility, feed intake, and activity level were assessed from day 1 to day 10 as described in table 1.

Statistical Analysis

The data were expressed as Mean ± standard error of mean (SEM). Data were subjected to statistical analysis using Repeated

Measures one-way ANOVA followed by a Dunnett’s multiple comparison tests to draw a comparison between before supplementation period of pHIT (day 0) and during the supplementation period of pHIT (i.e., day 1 to day 10).

Ethical Approval

Use of animals for this study was approved by CCSEA Government of India Protocol No. AHP-LA-14-23

Parameter	Description	Score
Rumen Motility Score	Normal - 2-5 contractions per 2 minutes	4
	Hypermotility - >5 contractions per 2 minutes	3
	Hypomotility - <2 contractions per 2 minutes	2
	Ruminal stasis - No motility	1
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
Activity Level Score	Normal - Active and alert	3
	Dull and depressed	2
	Sluggish and Lethargy	1

Table 1: General health assessment parameters grading system.

Results and Discussion

Haemoprotzoan diseases have a profound impact on the live-stock industry worldwide, resulting in significant economic losses. It is well established that most blood protozoan parasites trigger erythrophagocytosis, leading to anemia [26]. The clinical manifestations of haemoprotzoan infections are varied and can include fever, lymph node enlargement, nasal and ocular discharge [27], hemoglobinuria [28], progressive hemolytic anemia, fever, jaundice, decreased milk production, abortions, hyper excitability, and in rare cases, sudden death [29]. These infections can be fatal, and even if animals survive, they often require a prolonged recovery period during which their productivity, in terms of meat or milk production, is compromised. Fortunately, early diagnosis and effective treatment can significantly reduce mortality rates [26].

The primary goal of this study was to investigate the efficacy of oral Polyherbal Iron Tonic (pHIT) supplementation in alleviating anemia caused by haemoprotzoan infections, as well as improving the overall health of dairy cows.

Our study revealed a notable improvement in the FAMACHA score, a measure of anemia, as early as six consecutive days of pHIT supplementation. Moreover, after 10 consecutive days of supplementation, the dairy cows showed a marked alleviation of severe anemia, with their FAMACHA scores improving from severe to mild (Table 2). These findings suggest that pHIT supplementation can effectively help alleviate anemia caused by haemoprotzoan infections in dairy cows.

The supplemental effects of pHIT can be attributed to its individual herbal ingredients and nutrients, such as iron and cobalt. The FAMACHA system, a widely used method for clinically identifying anemia in animals infected with parasites, utilizes a chart to assess the degree of anemia [25].

Parameters	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Anemic Condition (FAMACHA Score)	5.00 ± 0.00	5.00 ± 0.00	5.00 ± 0.00	4.70 ± 0.15	4.70 ± 0.15	4.50 ± 0.17	***4.1 ± 0.23	***3.8 ± 0.25	***3.2 ± 0.25	***3.1 ± 0.28	***3.10 ± 0.28

Table 2: Effect of pHIT on anemic conditions in dairy cows.

Values are expressed as Mean ± SEM; n = 10

***p < 0.001 as compared to day 0 based on Repeated Measures One-way ANOVA followed by Dunnett’s Multiple comparison *post-hoc* test.

Traditional knowledge and scientific research have both highlighted the benefits of *Azadirachta indica* (*A. indica*) leaves in alleviating anemia, with experimental studies in rats showing that they can help maintain healthy hematological characteristics [30]. The anemia supporting properties of *A. indica* leaves are thought to be attributed to their high content of flavonoids, iron, and other minerals [30,31]. Additionally, *A. indica* leaves are rich in iron, zinc, and magnesium, which are essential for hemoglobin production [32].

Cichorium intybus (*C. intybus*), another key component of pHIT, has been found to possess potent antiparasitic properties when incorporated into the diet of ruminants [33]. The bioactive compounds present in *C. intybus*, particularly sesquiterpene lactones, are thought to be responsible for its antiparasitic effects, which have been demonstrated to be highly effective against helminths and protozoa in laboratory settings.

The results of our study indicate that supplementing pHIT caused significant improvements in various health parameters, including rumen motility, feed intake, and activity levels (Table 3). These findings suggest that the active ingredients present in the formulation of pHIT play a crucial role in enhancing appetite by improving rumen health, which in turn increases feed intake in animals.

Studies have demonstrated the potential of using herbal actives or phytochemicals of *Zingiber officinale* (*Z. officinale*) as phytochemical feed additives to enhance the growth and health of ruminants [34]. The inclusion of *Z. officinale* in the diet has been shown to increase feed conversion ratio, growth rate, nutrient digestibility, and palatability of the diet [34]. Feeding *Z. officinale* has also been reported to improve the growth of intestinal microflora, antimicrobial potential, coccidiostats, immunostimulation, and anthelmintic effects, ultimately increasing ruminant meat quality, safety, and health [34]. As a result, the quality of animal products are enhanced [35].

Z. officinale can improve digestion by improving salivary flow, which raises the secretion and activity of digestive enzymes. *Z. officinale* has been shown to have a positive impact on the gastrointestinal ecosystem, enhancing feed stability and preventing the proliferation of pathogenic microorganisms [36]. The active compounds in *Z. officinale*, including saponins, are thought to have a prebiotic effect, promoting a shift in the microbial population towards a more beneficial profile [37]. A study investigating the effects of *Z. officinale* supplementation on ruminal fermentation found that adding 0.005 mL of *Z. officinale* extract to dairy cattle feed resulted in significant increases in total volatile fatty acids and key metabolites, such as acetate, propionate, butyrate, ammonia (NH3), and methane (CH4) [38]. These results highlight the potential of *Z. officinale* to improve feed fermentation and support the health and productivity of dairy cattle.

Parameters	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Rumen Motility Score	1.70 ± 0.15	1.70 ± 0.15	2.00 ± 0.15	***2.2 ± 0.13	***2.9 ± 0.10	***2.9 ± 0.10	***3.0 ± 0.00	***3.0 ± 0.00	***3.0 ± 0.00	***3.0 ± 0.00	***3.0 ± 0.00
Feed Intake Score	1.60 ± 0.22	1.60 ± 0.22	*2.10 ± 0.23	***2.6 ± 0.16	***3.1 ± 0.18	***3.7 ± 0.15	***3.9 ± 0.10	***3.9 ± 0.10	***4.0 ± 0.00	***4.0 ± 0.00	***4.0 ± 0.00
Activity Level Score	1.70 ± 0.15	1.70 ± 0.15	2.00 ± 0.15	***2.5 ± 0.17	***2.8 ± 0.13	***2.9 ± 0.10	***3.0 ± 0.00	***3.0 ± 0.00	***3.0 ± 0.00	***3.0 ± 0.00	***3.0 ± 0.00

Table 3: Effect of pHIT on health parameters in dairy cows.

Values are expressed as Mean ± S; n = 10

*p < 0.05 and ***p < 0.001 as compared to day 0 based on Repeated Measures One-way ANOVA followed by Dunnett’s multiple comparison *post-hoc* test.

The health benefits observed in our study after pHIT supplementation can be attributed, in part, to the nutritional benefits of *Z. officinale*, one of the core ingredients in pHIT. Furthermore, the nutrient profile of pHIT, which includes essential micronutrients like iron and cobalt, may also contribute to its positive effects, potentially enhancing the bioavailability and efficacy of the bioactive compounds present in pHIT.

Literature reports evidenced that in farms where the dairy cows are generally in good health, cow longevity is mainly determined by farmers' subjective culling decisions that are driven by different factors. Culling, defined as the process of removing a cow from the herd, happens for a variety of reasons, including low productivity, low fertility, injuries and reduced health, and farmers' investment decisions [39-41]. Since, results of our study indicate that supplementing pHIT caused significant improvements in various health parameters, including rumen motility, feed intake, and activity levels; pHIT supplementation would be economically viable for dairy farmers.

Conclusion

The present study demonstrates that Polyherbal Iron Tonic (pHIT) is a valuable supportive supplement for dairy cows with anaemia, as evidenced by significant improvements in FAMACHA scores. The nutritional benefits of pHIT are attributed to its proprietary blend of herbal ingredients and nutrients, which work synergistically to address the complex needs of anaemic dairy cows and promote overall health and productivity. However, future studies with large number of samples and extended period of post-supplementation assessments are recommended to be carried in order to know the long-term effects of pHIT.

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Conflict of Interest

None to declare.

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