SSRG International Journal of Veterinary Science
ISSN: 2455–0868 / https://doi:10.14445/24550868/IJVS-V10I2P102

Volume 10 Issue 2, 7-12, May-Aug 2024


*Original Article*

# Study Nutritional Approach to Manage Udder Health Conditions in Dairy Cows

Manu K[1], Bhagwat VG[2*], Varun Kumar K[2]

[1]*Veterinary Consultant, Nelamangala, Bengaluru, Karnataka, India.*
[2]*Himalaya Wellness Company, Makali, Bengaluru, Karnataka, India.*

*Corresponding Author : dr.bhawat@himalayawellness.com*

Received: 05 May 2024 Revised: 08 June 2024 Accepted: 23 June 2024 Published: 08 July 2024

***Abstract*** *- This study explores the potential of a plant-based feed supplement, "Udder Care Formula (UCF)," to address udder health concerns in dairy cows. Traditionally, antibiotics are used to treat udder conditions; however, antibiotic resistance has been reported. This study investigates UCF as a possible alternative approach for cows with subclinical or clinical udder issues. They were given UCF 30g/day/cow for 5 days and monitored for various health markers, including temperature, udder condition, milk quality, and milk production. The results were promising. Cows receiving UCF showed significant improvement ($p < 0.001$) in several key areas, including reduced inflammation, improved udder quality, and increased milk yield. Although the milk's white blood cell counts and pH did not change significantly, other measures suggested an overall positive impact on udder health. Based on these findings, the study indicates that UCF supplementation could be a valuable preventative measure for udder health in dairy cows.*

***Keywords*** *- UCF, Udder health, Milk white blood cell count, Anti-inflammatory, Antimicrobial resistance.*

## 1. Introduction

Healthy udders are essential for dairy cows. They play a vital role in milk production and quality, as well as overall cow well-being. Udder health can be affected by various factors, and maintaining good udder health is important for dairy producers.

Several factors can influence udder health in cows, including proper milking techniques and equipment hygiene are crucial for maintaining healthy udders. Clean and comfortable housing conditions can help reduce the risk of udder issues. A well-balanced diet provides the nutrients cows need for good udder health.

Current practice for udder health issues in dairy cows primarily relies on antibiotics, which is crucial for maintaining herd health and welfare [1]. However, the overuse of antibiotics has led to the emergence of antimicrobial resistance, posing a significant threat to global health and food security [2, 3]. Non-steroidal anti-inflammatory drugs (NSAIDs) are increasingly being recognized for their role in controlling inflammation, pain, and endotoxin production in cows with udder health concerns [4].

Herbal medicines and supplements, which are plant-derived, have a long history of health benefits with limited side effects compared to antibiotics [5]. These supplements contain bioactive components that can prevent and improve udder health issues similar to antibiotics but without antibiotic residues in milk [6]. The herbal feed supplement "Udder Care Formula (UCF)" developed by Himalaya Wellness Company promotes udder development, strengthens tissues, improves milk quality, and boosts immunity and overall udder health.

## 2. Materials and Methods

### *2.1. UCF*

UCF is a herbal feed supplement developed by Himalaya Wellness Company in Bengaluru, marketed under the brand name "Healthy Udder Formula (HUF)" in India. It is made with a unique blend of herbs to support animal well-being. UCF is mainly composed of the following herbs: *Anethum sowa* (Shatapushpa), *Asparagus racemosus* (Shatavari), *Trigonella foenum-graecum* (Methi), *Ocimum sanctum* (Tulsi), and *Withania somnifera* (Ashwagandha) fortified with nutrients such as Vit. H, Vit. A, Vit. E, selenium, zinc, copper, and tri-sodium citrate.

### *2.2. Ethical Committee Approval*

This study was conducted following the Guidelines for the Care and Use of Animals and study protocol no. AHP-LA-12-22 was approved by the "Committee for Control and Supervision of Experiments on Animals."

### *2.3. Animal Selection*

A total of 25 Holstein Friesian and Jersey cross dairy cows between 3.5 and 5.0 years of age were selected based on the following inclusion and exclusion criteria from the rural Bengaluru district of Karnataka:

#### *2.3.1. Inclusion Criteria*

- Cows in the lactation period
- Cows affected with subclinical and clinical udder health concerns

- Cows with inflammatory and weak udder
- Cows with sluggish and leaky udder
- Cows with their altered milk pH

*2.3.2. Exclusion Criteria*

- Cows with mastitis with udder abscess
- Cows diagnosed with ascites and fatty liver syndrome
- Cows infected with foot and mouth disease
- Cows suffering from any severe disease condition *viz.* TB, metritis, and prolapse

### *2.4. Study Design and Experimental Details*

A set of 25 lactating dairy cows that met the inclusion criteria were chosen and supplemented with UCF for 5 days at a rate of 30 g per day per cow. The UCF was added orally to feed, combined with electuary, and given to lactating dairy cows that still had an intact gag reflex. Individual animals were kept under self-management; no control group was established. Day 0 of pre-supplementation was used as the control, who received a 5-day supplementation. Concurrent supplementation with other products to address subclinical/clinical udder health issues and promote udder health was not given when UCF was supplemented.

### *2.5. Animal Husbandry*

The farmers closely monitored the animals and kept them in regular housing on their property. The usual diet was provided, including roughages (avg. 34 kg/day/cow approx.) and concentrated feed (avg. 10 kg/day/cow approx.). The potable water was provided *ad libitum.*

### *2.6. Assessment Parameters*

The parameters *viz.* rectal temperature, pain on palpation of the udder, udder swelling, milk consistency, and udder quality parameters (i.e., udder shape and median sensory ligament) were assessed along with product performance score pre-supplementation (day 0) and subsequently on days 3 and 5 of UCF supplementation as described in Table 1.

The milk yield, i.e., the exact quantity of milk produced per day per cow, was recorded pre- (day 0) and post-supplementation (day 5) of UCF and assessed the impact of UCF on milk yield. Furthermore, milk samples were collected from the affected and non-affected quarters of all cow's pre-supplementation (day 0) and subsequently on days 3 and 5 of UCF supplementation and were subjected to evaluation of clinical parameters *viz.*, milk-white blood cell counts and pH.

### *2.7. Statistical Analysis*

Data were expressed as mean ± standard error of the mean (SEM) and were subjected to statistical analysis using two-way repeated measures analysis of variance followed by a Bonferroni multiple comparisons *post-hoc* tests to compare pre-supplementation (day 0) and subsequent days of supplementation, days 3 and 5. $p \leq 0.05$ was considered statistically significant.

**Table 1. Assessment parameters grading system**

| Parameter | Description | Score |
|---|---|---|
| A. Rectal temperature score | Normal (101–103°F) | 1 |
| | Fever (>103°F) | 2 |
| B. Pain score | No pain on udder palpation | 1 |
| | Presence of pain on udder palpation | 2 |
| C. Swelling of the udder score | No swelling (completely diminished) | 1 |
| | Mild reduction | 2 |
| | Swelling observed | 3 |
| D. Milk consistency score | Presence of blood | 4 |
| | Presence of clots and flakes | 3 |
| | Watery milk | 2 |
| | Normal consistency | 1 |
| E. Udder shape | Desirable udder | 1 |
| | Undesirable udder | 2 |
| | Extremely deep udder-hangs below | 3 |
| | Extremely shallow udder | 4 |
| F. Median suspensory ligament score | Udder with excellent median suspensory ligament | 1 |
| | Udder with extreme cleft of the median suspensory ligament | 2 |
| | Udder with poor or broken median suspensory ligament, udder bottoms out | 3 |
| G. Product performance score | Highly satisfied | 4 |
| | Moderately satisfied | 3 |
| | Neither satisfied nor dissatisfied | 2 |
| | Not satisfied (no relief) | 1 |

## 3. Results and Discussion

Udder health concerns are expected to be a persistent issue for commercial dairy farms. Now, antibiotics are the primary line of treatment; however, the emergence of strains resistant to many drugs in dairy farms and the possibility of the spread of pathogens affecting humans is a cause for concern. Therefore, alternative nutritional approaches are being sought for udder health concerns in dairy cows [1]. Polyherbal preparations have been used in traditional medicine for centuries due to their comprehensive and versatile approach. Polyherbal preparations have more opportunities and advantages compared with single herbal preparations due to their synergistic effects and multiple biological benefits [7].

Inflammation is a necessary healing process involving blood granulocytes and inflammatory mediators like prostaglandins [8]. Prostaglandins are crucial for generating an inflammatory response, leading to signs such as redness, swelling, and pain [9]. Our study found significant ($p < 0.001$) improvements in rectal temperature, swelling, and pain, indicating effective supplementation as early as 3 days for subclinical and clinical udder health concerns.

However, the swelling and pain completely resolved after 5 days of consecutive UCF supplementation, and the rectal temperature returned to normal after that. Milk consistency improved from watery milk to normal after dairy cows were supplemented with UCF for 5 consecutive days (Table 2). These findings may be affected by the pain and swelling-reducing properties of Phyto active substances in UCF.

It is well established in science that O. sanctum essential oil, which is contained in UCF, has anti-inflammatory properties in both in vitro and in vivo systems. The current study discovered that swelling of the udder and the appearance of discomfort when the udder was palpated were the two primary indicators of inflammation that indicated udder health issues. Dairy animals supplemented with UCF experienced a significant reduction in udder swelling and pain, indicating the supplement's ability to reduce swelling and pain. Generally, the ability to reduce pain is achieved by blocking inflammatory mediators such as lipoxygenase and/or cyclooxygenase or by preventing pain responses that are triggered by peripheral nociceptors. [10].

Additionally, the linolenic acids [11] and eugenol [12] found in O. sanctum oil have the ability to inhibit the arachidonate metabolism's cyclooxygenase and lipoxygenase pathways, which results in the synthesis of prostaglandins and leukotrienes and may be the source of the oil's anti-inflammatory properties. The active phytochemical in eucalyptus oil, 1, 8-cineole, is a unique natural antagonist of TRPA-1 receptors, which are known to be involved in the processing of inflammatory processes and unpleasant cold temperature signals [13]. Furthermore, through the downregulation of inflammatory mediators, selenium has anti-inflammatory properties [14, 15]. Therefore, swelling that lowers the UCF's characteristics may potentially be related to the UCF's selenium content.

Udder health concern occurs when the mammary gland's immune system is unable to prevent bacterial invasion; therefore, the immune activity should be enhanced to prevent and improve udder health concerns [16]. Our study results demonstrated that the udder shape and median sensory ligament scores were improved significantly ($p < 0.05$) as early as day 3 of UCF supplementation to dairy cows suffering from subclinical/clinical udder health issues. However, a desirable udder shape and udder with excellent median sensory ligament were obtained after 5 consecutive days of UCF supplementation (Table 3).

**Table 2. Effects of UCF on assessment parameters in dairy cows**

| Parameters | Day 0 | Day 3 | Day 5 |
|---|---|---|---|
| Rectal temperature score | 1.60 ± 0.10 | ***1.12 ± 0.07 | ***1.00 ± 0.00 |
| Pain on palpation score | 1.84 ± 0.09 | ***1.20 ± 0.08 | ***1.00 ± 0.00 |
| Swelling of udder score | 2.04 ± 0.17 | ***1.48 ± 0.10 | ***1.00 ± 0.00 |
| Milk consistency score | 2.20 ± 0.22 | ***1.64 ± 0.14 | ***1.00 ± 0.00 |

Values are expressed as mean ± SEM; n = 25

***$p < 0.001$ as compared to day 0 based on repeated measures two-way analysis of variance followed by Bonferroni multiple comparison *post-hoc* test

**Table 3. Effects of UCF on udder quality parameters in dairy cows**

| Parameters | Day 0 | Day 3 | Day 5 |
|---|---|---|---|
| Udder shape score | 2.20 ± 0.17 | ***1.36 ± 0.11 | ***1.00 ± 0.00 |
| Median sensory ligament score | 1.52 ± 0.12 | **1.12 ± 0.07 | ***1.00 ± 0.00 |

Values are expressed as mean ± SEM; n = 25

**$p < 0.01$ and ***$p < 0.001$ as compared with day 0 based on repeated measures two-way analysis of variance followed by Bonferroni multiple comparison post-hoc test

These findings endorse that the higher udder fitness of cows following UCF supplementation may be attributed to their higher immune status. Similarly, Sunder et al. additionally said development inside the udder fitness of cows fed with *Morinda citrifolia* fruit juice [17]. Furthermore, the research said that supplementation of nutrients A, D3, E, and H could assist get better subclinical udder fitness issues with the aid of using growing the

expression of host protection genes. Vitamin D turns on innate immune responses of bovine monocytes and alters the oxidants–antioxidants stability to normal [18, 19]. Hence, stepped forward udder immunity following UCF supplementation can also be because of the presence of nutrients Vit. H, A, and E inside the UCF.

The increased milk-white blood cell counts in dairy cows suffering from subclinical udder health concerns could be due to increased polymorph nuclear cells and neutrophils. In our study, results of clinical parameters *viz* white blood cell counts and pH of milk in dairy cows suffering from subclinical/clinical udder health concerns were non-significantly ($p > 0.05$) decreased following UCF supplementation (Table 4). Intramammary infection affects the white blood cell counts of milk at individual and herd levels [20]. Uninfected quarters milk generally contains <2 × $10^5$ somatic cells/ml. Pathogens or their metabolites are responsible for elevated white blood cells in milk and mammary glands [21]. The high white blood cell count content in milk in infected mammary glands was in line with earlier reported studies [22, 23].

**Table 4. Effects of UCF on clinical parameters in dairy cows**

| Parameters | Day 0 | Day 3 | Day 5 |
|---|---|---|---|
| Somatic cell count (cells/mL) | 143000 ± 5902 | 112000 ± 3000 | 127600 ± 34283 |
| Milk pH | 6.80 ± 0.02 | 6.70 ± 0.01 | 6.56 ± 0.01 |

Values are expressed as mean ± SEM; n = 25

$p > 0.05$ as compared with day 0 based on repeated measures two-way analysis of variance followed by Bonferroni multiple comparison *post-hoc* test

**Table 5. Effects of UCF on milk yield in dairy cows**

| Parameters | Pre-supplementation | Post-supplementation |
|---|---|---|
| Milk yield (L) | 11.82 ± 0.41 | ***12.80 ± 0.38 |

Values are expressed as mean ± SEM; n = 25; ***$p < 0.001$ as compared with pre-supplementation based on unpaired t-test

Charjan et al. reported that increased pH of milk could be considered the best indicator to evaluate the udder health in cows. Fresh milk (normal) has approximately a pH of 6.6–6.9, indicating that the milk is slightly acidic. The increased milk pH due to the severity of udder health concerns may be attributed to the decreased acidity found in milk from unhealthy udder [24]. The decreased acidity in milk from unhealthy udder is due to reduced lactose contents due to minimal lactic acid formation [25]. The decreased milk pH after UCF supplementation might be due to reduced alkalinity because of inflammation caused by an increased number of $Na^+$ and $Cl^-$ ions in the milk [26]. The improvement results of Mooventham et al. on *Moringa oleifera* leaves, and Jaguezeski et al. on curcumin supplementation are in agreement, where they reported a reduction in the pH of milk [27, 28].

Furthermore, the milk yield (L) was significantly increased ($p < 0.001$) following UCF supplementation to dairy cows suffering from subclinical/clinical udder health concerns in our study (Table 5).

These findings can be understood from natural galactagogues inside the UCF. Galactagogue is a substance that promotes lactation in dairy animals and acts by exerting power on an adreno-hypothalamo-hypophyseal-gonadal axis by inhibiting hypothalamic dopaminergic receptors or dopamine-generating neurons. These medicines promote prolactin secretion through antagonizing dopamine receptors [29]. Bakshi et al. mentioned that natural plant life is extensively used as animal feed additives, having galactagogue homes like T. foenum-graecum [30]. T. foenum-graecum has been used for hundreds of years as a motive for galactagogue. Moreover, this herb has been extensively powerful in selling the lactation overall performance in ruminants [31]. Furthermore, supplementation of A. racemosus (Shatavari), Jivanti, and T. foenum-graecum (Fenugreek) in identical share on the dose fee of 60g/cow/day extensively multiplied milk yield and day-by-day go-back earnings in lactating Kankrej cows [32].

The results during the recovery period depicted that those dairy cows suffering from subclinical/clinical udder health concerns recovered after 5 consecutive days of UFC supplementation. This study investigates a plant-based feed supplement's potential to improve udder health in dairy cows. Traditionally, antibiotics address udder concerns; however, there are worries about antibiotic resistance. This study explores the supplement as a possible alternative, monitoring cows with udder issues given the supplement for 5 days. Various health markers, including temperature, udder condition, milk quality, and milk production, were closely monitored to assess the supplement's effectiveness (Table 6).

**Table 6. Effects of UCF on the recovery period and product performance score in dairy cows**

| Parameters | Score |
|---|---|
| Recovery period (days) | 4.88 ± 0.12 |
| Product performance score | 4.00 ± 0.00 |

Values are expressed as mean ± SEM; n = 25

Overall, our study findings inferred that the anti-inflammatory, antimicrobial, and galactogouge properties of herbs such as *A. sowa* (Shatapushpa), *A. racemosus* (Shatavari), *T. foenum-graecum* (Methi), *O. sanctum* (Tulsi), and *W. somnifera* (Ashwagandha) might have been

contributed in the improvement of udder health, thereby minimizing the incidence of dairy cows suspicious for subclinical and clinical udder health concerns and enhancing the milk production.

## 4. Conclusion

Supplementing dairy cows with the polyherbal supplement "UCF" for 5 days significantly relieved udder pain and swelling, improved the milk-white blood cell count and pH, and increased milk production. The supplement also improved mammary gland repair, elasticity, and milk quality without any observed side effects, suggesting that using "UCF" at 30 g per cow per day for 5 days can prevent and improve subclinical and clinical udder health concerns in dairy cows.

## Acknowledgements

The authors acknowledge Dr. U. V. Babu of Himalaya Wellness Company, Bengaluru, Karnataka, India, for their kind support and encouragement for the study.

## References

[1] Xiaoping Li et al., "Alternatives to Antibiotics for Treatment of Mastitis in Dairy Cows," *Frontiers in Veterinary Science*, vol. 10, 2023. [CrossRef] [Google Scholar] [Publisher Link]

[2] V. Kromker, and S. Leimbach, "Mastitis Treatment—Reduction in Antibiotic usage in Dairy Cows," *Reproduction in Domestic Animals*, vol. 52, no. S3, pp. 21-29, 2017. [CrossRef] [Google Scholar] [Publisher Link]

[3] World Health Organization, Global Action Plan on Antimicrobial Resistance, 2015. [Online]. Available: https://www.who.int/publications/i/item/9789241509763

[4] Iqra Muzammil et al., "Drug Repurposing Strategy: An Emerging Approach to Identify Potential Therapeutics for Treatment of Bovine Mastitis," *Microbial Pathogenesis*, vol. 171, p. 105691, 2022. [CrossRef] [Google Scholar] [Publisher Link]

[5] Tamiris Silva Lopes et al., "Use of Plant Extracts and Essential Oils in the Control of Bovine Mastitis," *Research in Veterinary Science*, vol. 131, pp. 186-193, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[6] Baishuang Yin et al., "The Use of Chinese Skullcap (*Scutellaria Baicalensis*) and Its Extracts for Sustainable Animal Production," *Animals*, vol. 11, no. 4, p. 1039, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[7] Xian Zhou et al., "Synergistic Effects of Chinese Herbal Medicine: A Comprehensive Review of Methodology and Current Research," *Frontiers in Pharmacology*, vol. 7, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[8] Carl Nathan, "Points of Control in Inflammation," *Nature*, vol. 420, pp. 846-852, 2002. [CrossRef] [Google Scholar] [Publisher Link]

[9] Colin D. Funk, "Prostaglandins and Leukotrienes: Advances in Eicosanoid Biology," *Science*, vol. 294, no. 5548, pp. 1871-1875, 2001. [CrossRef] [Google Scholar] [Publisher Link]

[10] Mohammad Ashiqur Rahman Bhuiyan Shovo et al., "Computational and Pharmacological Studies on the Antioxidant, Thrombolytic, Anti-inflammatory, and Analgesic Activity of *Molineria Capitulata*," *Current Issues in Molecular Biology*, vol. 43, no. 2, pp. 434-456, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[11] Gopi Nath, T.B. Suneetha, and Mruganka Deshpande, "Preliminary Analysis of Two Medicinal Plants against Causative Organism of Bovine Mastitis," *International Journal of Phytomedicine*, vol. 3, no. 3, p. 333, 2011. [Google Scholar]

[12] Apparecido N. Daniel et al., "Anti-inflammatory and Antinociceptive Activities A of Eugenol Essential Oil in Experimental Animal Models," *Revista Brasileira de Farmacognosia*, vol. 19, no. 1b, 2009. [CrossRef] [Google Scholar] [Publisher Link]

[13] Masayuki Takaishi et al., "1, 8-cineole, a TRPM8 Agonist, is a Novel Natural Antagonist of Human TRPA1," *Molecular Pain*, 2012. [CrossRef] [Google Scholar] [Publisher Link]

[14] Junkun Ma et al., "Selenium Attenuates *Staphylococcus Aureus* Mastitis in Mice by Inhibiting the Activation of the NALP3 Inflammasome and NF-κB/MAPK Pathway," *Biological Trace Element Research*, vol. 191, pp. 159-166, 2019. [CrossRef] [Google Scholar] [Publisher Link]

[15] Heng Wang et al., "Selenium Ameliorates *Staphylococcus Aureus*-Induced Inflammation in Bovine Mammary Epithelial Cells by Inhibiting Activation of TLR2, NF-κB and MAPK Signaling Pathways," *BMC Veterinary Research*, vol. 14, no. 197, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[16] Xiao-Hong Li et al., "*Taraxacum Mongolicum* Extract Induced Endoplasmic Reticulum Stress Associated-apoptosis in Triple-negative Breast Cancer Cells," *Journal of Ethnopharmacology*, vol. 206, pp. 55-64, 2017. [CrossRef] [Google Scholar] [Publisher Link]

[17] Jai Sunder et al., "Effect of Feeding of Morinda Citrifolia Fruit Juice on the Biophysical Parameters of Healthy as Well as Mastitis-affected Cow Milk," *Journal of Applied Animal Research*, vol. 41, no. 1, pp. 29-33, 2013. [CrossRef] [Google Scholar] [Publisher Link]

[18] Kathryn E. Merriman et al., "Intramammary 1, 25-Dihydroxyvitamin D3 Treatment Increases Expression of Host-Defense Genes in Mammary Immune Cells of Lactating Dairy Cattle," *The Journal of Steroid Biochemistry and Molecular Biology*, vol. 173, pp. 33-41, 2017. [CrossRef] [Google Scholar] [Publisher Link]

[19] Kathryn E. Merriman et al., "Intramammary 25-Hydroxyvitamin D3 Treatment Modulates Innate Immune Responses to Endotoxin-induced Mastitis," *Journal of Dairy Science*, vol. 101, no. 8, pp. 7593-7607, 2018. [CrossRef] [Google Scholar] [Publisher Link]

[20] Abdirahman Bare Dubad, Mohamed Shiekh Mahmud, and Hasan Mohamed Hasan, "Prevalence of Mastitis in Camel, Cattle and Goats at Benadir Region in Somalia," *Journal of Veterinary Science and Technology*, vol. 10, no. 5, 2019. [Google Scholar]

[21] Savas Atasever, "Estimation of Correlation Between Somatic Cell Count and Coagulation Score of Bovine Milk," *International Journal of Agriculture and Biology*, vol. 14, pp. 315-317, 2012. [Google Scholar]
[22] R.M. Bruckmaier, C.E. Ontsouka, and J.W. Blum, "Fractionized Milk Composition in Dairy Cows with Subclinical Mastitis," *Veterinariai Medicina Czechoslovakia*, vol. 49, pp. 283-290, 2004. [Google Scholar]
[23] Bassirou Bonfoh et al., "Raw Milk Composition of Malian Zebu Cows (*Bos Indicus*) Raised Under Traditional System," *Journal of Food Composition and Analysis*, vol. 18, no. 1, pp. 29-38, 2005. [CrossRef] [Google Scholar] [Publisher Link]
[24] Ku P.Y. Charjan et al., "Changes in Milk pH and The Levels of Na and K in Whey Associated with Udder Health Status of Cow," *Indian Veterinary Journal*, vol. 77, no. 12, pp. 1066-1068, 2000. [Google Scholar] [Publisher Link]
[25] A. Legesse et al., "A Comparative Study on the Physicochemical Parameters of Milk of Camel, Cow and Goat in Somali Regional State, Ethiopia," *Chemical Science Journal*, vol. 8, no. 4, 2017. [CrossRef] [Google Scholar] [Publisher Link]
[26] Tanveer Ahmad et al., "Effect of Severity of Mastitis on pH and Specific Gravity of Buffalo Milk," *Pakistan Journal of Agricultural Science*, vol. 42, no. 3-4, pp. 64-67, 2005. [Google Scholar] [Publisher Link]
[27] P. Mooventhan et al., "Indigenous Ethnoveterinary Medicinal Practices for Management of Mastitis in Dairy Cattle," *Indian Journal of Animal Research*, vol. 50, no. 1, pp. 137-139, 2016. [CrossRef] [Google Scholar] [Publisher Link]
[28] Antonise Mariely Jaguezeski et al., "Addition of Curcumin in Dairy Sheep Diet in the Control of Subclinical Mastitis," *Acta Scientiae Veterinariae*, vol. 46, no. 7, 2018. [CrossRef] [Google Scholar] [Publisher Link]
[29] Michael P. Gabay, "Galactogogues: Medications that Induce Lactation," *Journal of Human Lactation*, vol. 18, no. 3, pp. 274-279, 2002. [CrossRef] [Google Scholar] [Publisher Link]
[30] M.P.S. Bakshi et al., "Impact of Herbal Feed Additives on the Degradability of Feed Stuffs in Vitro," *Indian Journal of Animal Nutrition*, vol. 21, no. 4, pp. 249-253, 2004. [Google Scholar]
[31] M.A. Alamer, and G.F. Basiouni, "Feeding Effects of Fenugreek Seeds (*Trigonella Foenum-graecum* L.) on Lactation Performance, Some Plasma Constituents and Growth Hormone Level in Goats," *Pakistan Journal of Biological Sciences*, vol. 8, no. 11, pp. 1553-1556, 2005. [CrossRef] [Google Scholar] [Publisher Link]
[32] V.K. Patel et al., "Effect of Herbal Galactogogue Supplementation on Production Performance of Lactating Kankrej Cows," *International Journal of Current Microbiology and Applied Sciences*, vol. 6, no. 12, pp. 2093-2098, 2017. [CrossRef] [Google Scholar] [Publisher Link]