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Enhancing Milk Production and Quality in Cattle Through *Spirulina*-Based Feed Supplementation

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Abstract

Spirulina is a microscopic alga commonly found in freshwater. *Spirulina* is a rich source of protein. *Spirulina* was cultured and multiplied on Zerruk medium and dehydrated in a hot air oven. *Spirulina* dry powder is fed to cattle with dosages of 05g, 10g, 15g, and 20g corresponding to common animal feed. 20 gm *spirulina* with regular feeding showed significant results in terms of milk yield and fat percentage. According to one study, feeding dairy animals 20 grams of *spirulina* increased milk production by 14.77 liters per day compared to a control group. Fat percentage in treatment T5 increased by 1.3%. compared with the control.

Keywords: *Spirulina*, Cattle, Milk, Fat

Introduction

Spirulina platensis is a blue-green (length: 50-500 μm , width: 3-4 μm) multicellular (prokaryotic) microalgae belonging to the phylum Cyanobacteria. Taxonomically, "*Spirulina*" mainly describes two species of cyanobacteria, *Arthrospira platensis* and *Arthrospira maxima*.

People who live close to the alkaline lakes where *spirulina* is naturally found have long utilised it as a nutritional supplement. Up to the 16th century, the Aztecs and other Mesoamericans in Mexico consumed it as food. One of Hernan Cortés' soldiers recounted the harvest of algae at lake Texcoco and the selling ascakes called "tecuitlatl". The Kanembu ethnic group has utilized it and continues to use it as food in the Lake Chad region of the Republic of Chad, where it is sold as dried bread known as "dihe." A European research mission uncovered this traditional cuisine in Chad, and it is now extensively consumed around the globe and has grown in popularity in the human health food sector. It is gathered from natural water in many African nations, dried, and consumed as a significant source of protein, and it is also utilised as a protein supplement and health food in many Asian nations. *Spirulina* has been employed as an additional dietary component of fish, shrimp, and poultry feed as well as an increasingly popular source of protein and vitamins for aquafeeds (Holman and Malau-Aduli, 2012) [1].

Therefore, for future profitability and sustainable animal production, it is essential to identify new feed resources. The new feed resource should, in theory, have a high nutritional value and conversion efficiency, be capable of optimizing the quality of animal products and make efficient use of both land and water.

The major goals of this work were to review the nutrient makeup of spirulina, and incorporate the impact of dietary spirulina supplementation on the well-being and output of animals (Grahl *et. al.*, 2020) [2].

Materials and Methods

Pure culture of *Spirulina* was purchased from Krishi Vidnyan Kendra in Babhaleshwar, and it was multiplied on the medium made by Zarruk. 40 skewers of pure inoculum were used to produce 1 liter of stock inoculum, which was then multiplied on liquid medium while maintained on a solid slant. Purified cultures are transferred under aseptic conditions to ensure purity (Rosenau *et. al.*, 2022) [3].

Bulk Production: The root culture of *spirulina* was developed at Padmashri Vikhe Patil College, Pravaranagar. The cultivation of *spirulina* will be carried out in beds 60 cm high, 1 meter wide and 3 meters long. To stir up pond culture, a water wheel with a manual or electric motor is installed.

Nutrients Amount

Sodium bicarbonate: 10 gm/lit. of water

Suphala fertilizer (15:15:15 N:P:K): 1 gm/lit. of water

Magnesium Suphate: 0.2gm/lit, of water

The culture medium was stirred six to eight times per day for one hour each. When the optical density of the inoculum reached 0.8 to 0.9 after 10 to 12 days, it was found that it had reached its maximum potential. After being diluted with water and nutrients, the culture depth was not attained (18-20 cm) for another 10-12 days (Ragaza *et. al.*, 2020) [5].

Harvesting: Harvesting of biomass was started after the culture medium reached maximum growth (optical density 0.8-0.9). Harvest 2-3 days apart by simple gravity filtration. The harvested culture was filtered through a 350-mesh fine woven synthetic cloth. Before filtration, the culture was passed into a 200-micron sieve to remove any foreign impurities such as insects, larvae, leaves, etc (Rosenau *et. al.*, 2022) [3].

Drying: The cleaned seaweed slurry was spread on a polythene sheet and dried for three to four hours in a hot air oven at 45 to 52° C. Dried *spirulina* flakes were made into powder, then used for direct feeding (Rosenau *et. al.*, 2022) [3].

Consumption of *spirulina*: The dry powder was mixed into the feed at different concentrations and fed to the animals. Prepared treatments are T₁, T₂, T₃, T₄, T₅.

Table 1: Treatment and Concentration of *Spirulina* (gm/cow/day)

Treatments	The concentration of <i>Spirulina</i> (gm/cow/day)
T ₁	Regular Feed and Fodder to the Animal (Control)
T ₂	Regular Feed and Fodder + 5 gm <i>Spirulina</i>
T ₃	Regular Feed and Fodder + 10 gm <i>Spirulina</i>
T ₄	Regular Feed and Fodder + 15 gm <i>Spirulina</i>
T ₅	Regular Feed and Fodder + 20 gm <i>Spirulina</i>

Results and Discussion

Trials of *spirulina* with dairy cows have shown successful results with a clear impact on production. To increase the quantity and quality of milk produced by lactating animals, the daily diet was supplemented with 5, 10, 15 and 20 g of *spirulina*. According to this study, feeding dairy cows with 20 grams of spirulina increased milk production by 2.72 liters compared to the control group. In addition, the fat percentage increased by 1.3% in the T₅ treatment compared to the control (Jense, A., 1978) [4].

Table 2: Comparative study of *Spirulina* Feeding on Milk Production

Treatment	Average Milk Production (Lit./Day/Cow)	Fat (%)
T ₁ -Regular Feed and Fodder to the Animal (Control)	12.05	2.6
T ₂ - Regular Feed and Fodder + 5 gm <i>Spirulina</i>	13.40	2.9
T ₃ -Regular Feed and Fodder + 10 gm <i>Spirulina</i>	13.65	3.2
T ₄ -Regular Feed and Fodder + 15 gm <i>Spirulina</i>	14.22	3.6
T ₅ -Regular Feed and Fodder + 20 gm <i>Spirulina</i>	14.77	3.9

Conclusion

Therefore, the study concluded that the consumption of *spirulina* for cattle in their daily diet Enhancing milk quality and quantity.

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