

# Evaluating the Influence of Various Forage Plant Varieties and Concentrate Additives in Milk Production and Quality in Cows

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## Abstract

The intention of this investigation is to examine the impact of specific forage plants and concentrated supplements on the quantity and quality of milk produced by local and crossbred cattle. A total of thirty lactating cattle, with an approximate body weight ranging from 300 to 350 kg and an age range of 5 to 11 years, were utilized for the investigation. The cattle were categorized into six groups, each consisting of five individuals. C<sub>1</sub> and C<sub>2</sub> were (local and crossbred cows, accordingly) exclusively fed with clover. C<sub>3</sub> and C<sub>4</sub> (local and crossbred cows, respectively) were given a diet of both clover and sorghum stover. C<sub>5</sub> and C<sub>6</sub> (local and crossbred cattle, respectively) were fed a combination of clover and concentrations. The findings indicated that the crossbred cattle in group C<sub>6</sub> exhibited the maximum milk production (18.5k/day) compared to the other categories, with a significant difference ( $p < 0.05$ ). Following C<sub>6</sub>, group C<sub>5</sub> had an average milk production of 13.9k/day. Groups C<sub>2</sub>, C<sub>4</sub>, C<sub>1</sub> and C<sub>3</sub> had average milk yields of 11.46k/day, 9.70k/day, 8.5 k/day and 8.7k/day, correspondingly. Regarding the milk elements, the experimental categories exhibited a notable variance ( $p < 0.05$ ) that can be linked to the kind of food and breeding. C (6) had the maximum fat content, measuring 6%, while C (3), (4) and (5) recorded fat contents of 4.5%, 4.7% and 5.7% sequentially. The dairy from C (1) and (2) exhibited the minimum fat level (3.7%) with statistical significance ( $p < 0.05$ ). The statistical assessment revealed a significant rise ( $p < 0.05$ ) in protein percentage for category (3) (6%), when compared to the other categories (1), (2), (4), (5) and (6), which registered protein percentages of 4.8%, 4.7%, 4.9%, 4.3% and 4.5%, respectively. The overall solids of C(1) and (2) were 13.4% and 13.6%, respectively, which were partially less ( $p < 0.05$ ) than the numbers achieved by cattle in C(3), (4), (5) and (6) of 14.7%, 14.9%, 14.7% and 14.9%, respectively. Furthermore, a substantial degree of variance was observed in the dust percentage clover (1) had a dust concentration. The liquid content of C (1) 89.5 and 90.9 C (2) was greater ( $p < 0.05$ ) compared to the other experimental groups C (3), (4), (5) and (6), which had water contents of 87%, 786.3%, 87.1% and 86.6% correspondingly.

**Keywords:** Forage Plants, Milk Production, Quality Cows, Clover, Sorghum Stover, Clover And Concentrations.

## INTRODUCTION

Dairy companies are crucial in satisfying the worldwide need for superior milk and its products. As we want to achieve ecologically effective agricultural methods, it is essential to investigate and comprehend the elements that impact milk output and quality in dairy cattle (1). An essential factor is the selection of forage plant types and the use of concentrate supplements in the diets of these cattle. Forage plants, which include a variety of grasses and legumes, are essential components of a dairy cow's food (2). Their dietary supplements exert a significant impact on both the amount and grade of milk generated. The purpose of the work is to assess the impact of various grazing vegetation on the overall welfare and production of hybrid cattle. By conducting a meticulous analysis of the nutritional attributes of different forage creatures, we can gain useful insights into their efficacy in facilitating optimal dairy production. (3).

The purpose of these complements is to enhance the nutritional content of the primary diet, increasing milk manufacturing and enhancing its condition. The experiment intends to ascertain the most advantageous concentrate additives for hybrid cattle, considering factors such as protein phases, energy content and overall nutritional equilibrium. Hybrid cows are two separate aspects of the dairy business (4). Indigenous breeds exhibit distinct genetic characteristics suited to certain geographical areas, but crossbred cows are selectively bred to achieve higher levels of output. Gaining insight into the impact of different types of forage and concentrated additives on milk production in distinct populations is crucial for customizing dietary strategies to optimize productivity and durability.

The identification of forage plant species is a crucial point in our investigation. The investigation focuses on identifying the ideal combinations of forage that enhance milk production and improve its quality by utilizing a variety of plant species, each with distinct nutritional profiles (5). The use of concentrated additives adds another aspect to the investigation, aiming to uncover the combined impacts of these supplemented with different types of forage. The production of milk, a complex phenomenon influenced by various circumstances, is the main statistic that is examined (6).

The dairy sector is situated at the convergence of agriculture, technologies and animal inquiry, with a central emphasis on improving milk output and quality in cows. Recognizing the delicate interaction of genetics, health and administration techniques is becoming increasingly important as global demand for high-quality milk grows. Separating the complexity of cattle dairy manufacturing not only improves agricultural effectiveness but also secures the distribution of nutritional and nutritious dairy goods to customers all over the country (7, 8).

Study (9) evaluated the impact of feeding sheep and cattle together or separately, as well as the effects of the types of plants in the pasture on the behavioral patterns of the animals. Sheep and cattle exhibited distinct variations in their feeding behavior in response to variations in vegetation composition and grazing management, indicating their capacity to respond to various conditions and environmental situations.

Research (10) analyzed the quality and variety of plant creatures digested by cows in a tropical dry forest that affect their preference and “voluntary intake (VI)” throughout two different seasons. The investigation determined that the acahual flora offers abundant nourishment for ruminant animals due to its rich plant diversity, ensuring the vitality index and proper nutrient supply for cattle.

Article (11) developed a relationship between the utilization of “neutral detergent fiber (NDF)” in vitro and in vivo and the biological structure of forages. We focused on the presence of “para-coumaric (pCA) and ferulic acids (FA)” in the forages that were provided to milk cows. The findings from the in vivo investigation were consistent with the vitro data, showing that cattle feeding grass forage with the lowest levels of pCA in the NDF fraction had the highest total tract and NDF digestibility. The NDF examination was performed using  $\alpha$ -amylase and sodium sulfite.

Paper (12) investigated milk production, “N<sub>2</sub>-fixation” and “N transfer,” fodder productivity and quality in a “silvopastoral system (SPS)” consisting of “*Leucaena leucocephala*-*Megathyrus maximus* (LLMM)” and “*M. maximus*-monoculture (MMM)” with crossbreed cattle. SPS had the capacity for maintenance and transmission significant quantities of N<sub>2</sub> to the connected grass, hence enhancing the content of “crude protein (CP)” in feed and boosting dairy productivity.

Study (13) examined the various elements of pasture administration, animal supplementing, ecology and the socioeconomics of intensifying grassland operations. Enhancing feeding administration had the capacity to reduce “greenhouse gas (GHG)” emissions by decreasing the concentration of CO<sub>2</sub> emissions and conserving natural regions, hence minimizing the necessity for growing pastureland.

Research (14) evaluated the “grazing behavior (GB),” nutritional value of the diet and efficiency of sheep, goats, cattle and camels that were co-grazing, considering their respective physical proportions. The results showed that there was less overlap in the feeds of different livestock animals, which led to a higher animal yield when they grazed compared to separately.

Article (15) investigated the impact of daily consumption of 10 g of rosemary or lemongrass plants on feed consumption, milk manufacturing, substance and fatty acid content in nursing Damascus goats. The result demonstrated that lactating Damascus goats had improved nutritional digestion, milk production and ruminal fermentation when given 10 g/goat daily of rosemary and lemongrass.

Paper (16) investigated Lactating Friesian cattle' feed consumption, ruminal fermentation and milk output were improved when three g/cow/d of phytogetic lactation made from pulverized forage and animals enhanced with specific extracts and essential oils were added to their diet. It was found that nursing Friesian cattle's milk production and feed utilization were improved when a lactation combination was added to their diet.

Study (17) examined the importance of milk processing features as product traits. The variables that contribute to their variation remain largely unknown, because of the resources needed by traits in a large enough population. The enhancement in milk coagulation characteristics towards the end of breastfeeding was no longer discernible when protein concentration was incorporated into the model.

Research (18) investigated that milk production (mean 8.39 L/day), parity and body weight of twelve breastfeeding Sahiwal cows were used to classify them into three equal groups. Accordingly, milk production was enhanced in nursing Sahiwal cows fed a concentrate combination that included 20% brown seaweed.

Article (19) examined the effects on production, nutrient digestibility, energy balance and carryover effects of providing Ca solutions of "palm fatty acids (FA)" and maize grain-processing technology to early-lactation dairy cows roaming tropical grassland. Finally, the corn grain processing procedure had an impact on productivity reactions and it was carried over to pasture cattle when supplemented with "Calcium Salts of Palm Oil (CSPO)."

Paper (20) investigated the impact of several grassland and Clover plant pastures on 'dry matter (DM)' consumption, milk manufacture and grazing behavior in dairy cattle. The variations in "organic matter digestibility (OMD)" account for "observed energy-corrected milk (ECM)" disparities among grassland varieties; for a specific OMD level, feeding Clover enhanced ECM.

This investigation is to examine the influence of concentrated additions on both the quantity and quality of milk produced by cattle. By conducting a detailed examination of nutritional enhances, we want to develop effective methods to improve productivity and quality, promoting environmentally friendly coupled with an effective techniques in milk production.

## **MATERIAL AND METHODS**

### **Geographic Region**

Thirty lactation cows located in the western region of Karnataka in India, weighing between 300 and 350 kg, were chosen. These cows were either local Kenana or Butana breeds or crossbred with a combination of local and Friesian breeds. They were split into six categories and fed different rations for a period of fifty days.

### **Evaluate foods**

Clover was given an unlimited supply of food by the native breed C<sub>1</sub> and the crossbred C<sub>2</sub>. Clovers C<sub>3</sub> along with C<sub>4</sub> were given a 1:1 mixture of clover and sorghum stover, whereas clovers C<sub>5</sub> and C<sub>6</sub> were each given 3 kg of clover with a concentrated feed that included peanut cakes as well as sorghum grain.

### **Collection and chemical evaluation**

The regular milk production (measured in kilograms) of the categories was recorded both in the early morning and in the evening. A total of thirty samples were collected on a weekly basis to determine the chemical foundation. Each sample was taken from a different cow. The institution conducted an analysis of experimental milk collections from each category using the Ecomilk Ultrasonic (Milk-analyzer) to establish the precise proportions of fat, protein, dust, liquid and solid components.

### Mathematical assessment

All categories' data were used to complete an analysis of variance (ANOVA) using the Statistical Package for the Social Sciences (SPSS). The procedures were segregated using the Least Significant Difference (LSD) approach at a significance level of 6%.

## RESULTS AND DISCUSSION

### Dairy production

The impact of dietary interventions on the milk production of dairy cows is illustrated in Table (1). The findings indicated that the milk production was influenced ( $p < 0.05$ ) by the feed category. The clover of crossbred cows ( $C_6$ ) that were fed a combination of clover and concentrate supplement that exhibited higher milk yield (18.5 kg/day) compared to the other categories. The clover of local bred cows ( $C_5$ ) had an average milk yield of 13.9 kg/day. The hybrid cows exhibit a higher level of milk productivity compared to the native-bred cows under identical settings, indicating a sense of moral superiority. The observed result here aligns with the discovery that suggests feeding cows with oil seed cakes comprising a higher proportion of protein, which enhances milk production, is a beneficial supplement for animals fed on pasture. Prior studies have shown that nursing dairy cows grazing on natural pasture see an increase in milk output when they are given additional concentrate supplementation. The addition of concentrate enhances the overall milk yield. Higher concentrations of feed reduced the consumption of grass silage but had a tendency to enhance the consumption of low-starch maize silage. Additionally, there was a linear rise in milk production, milk components and milk protein composition ( $P < 0.001$ ) for both types of forage.

The majority of dairy producers utilize forages as a strategy to decrease feed expenses and enhance net profits for lactation cows. Dairy producers that feed fodder to lactation cows might decrease the quantity of concentration in their diet to maximize profitability relative to the demand for concentrate. The current findings suggest that feeding cows on clover is insufficient to meet the nutritional needs of dairy cows, which aligns with previous research. They asserted that relying solely on alfalfa is insufficient for achieving high productivity or rapid growth. Substituting red clover with normal or brown midrib corn silage in the diet enhanced milk production and dehydrated substance consumption in independent examinations of lactating milk cattle.

**Table (1).** Effectiveness of consuming clover, sorghum stover and concentration on dairy cattle milk production (kg/head/day) during a consuming experiment

(Source: author)

Feed	Clovers	Means	SD	Total Means $\pm$ SD	F-test
Clover	$C_L$	8.5	0.44	$9.80 \pm 0.44$	b*
	$C_C$	11.46	0.80		
Clover + Sorghum stover	$CS_L$	8.70	0.70	$9.46 \pm 0.70$	c*
	$CS_C$	13.90	0.90		
Clover + concentrates	$CC_L$	13.90	0.80	$16.25 \pm 0.74$	a*
	$CC_C$	18.5	0.74		

This means the columns followed by different superscripts are different ( $p < 0.05$ ).

$C_1$  and  $C_2$  was enhanced with clover, whereas  $C_3$  and  $C_4$  were supplied with a combination of clover and sorghum stover.  $C_5$  and  $C_6$  were provided with a combination of clover and concentrate.

### Dairy content %

The chemical evaluation of the milk elements revealed recognized variations among the simulated categories. The structure of milk fat was influenced by the quantity and formulation of the dietary element. The genotype

had a notable impact on the milk production metrics. Cows with high merit had the greatest milk yield, fat content, protein content and lactose content. Conversely, cows with low merit had the lowest amounts of milk fat, protein and lactose. C<sub>6</sub> had the largest significant ( $P<0.05$ ) fat content in milk, with a percentage of 6.3%, surpassing the other clovers. The use of cotton seed cakes as a supplement resulted in a increased output of milk fat and milk protein compared to treatments without concentrate supplements. The milk fat composition of C<sub>3</sub>, C<sub>4</sub> and C<sub>5</sub>, which were 4.7%, 7.7% and 4.8% correspondingly, to a greater extent ( $p<0.05$ ) than the readings obtained from C<sub>1</sub> and C<sub>2</sub>, which were fed exclusively on clover with a fat level of 3.7%. The milk fat content of lactation cows fed alfalfa silage was recorded at 3.90%, while those fed red clover silage had a milk fat content of 3.50%. Egyptian clover, a leguminous crop, is the primary source of protein but lacks sufficient carbs. This deficiency has a negative impact on the microbial populations and their protein synthesis, which disrupts acetate formation and reduces milk fat synthesis. The fiber level of the entire maize or sorghum crop was larger than that of Egyptian clover, resulting in natural buffering and an improved ratio of acetate and propionate. This, in turn, led to an enhancement in milk fat content.

### Dairy protein

The present investigation revealed significant ( $P<0.05$ ) variations in the percentage of milk protein. C<sub>3</sub> exhibited the greatest milk protein content at 6.0%, surpassing C<sub>1</sub>, C<sub>2</sub>, C<sub>4</sub>, C<sub>5</sub> and C<sub>6</sub>, which had protein contents of 4.8%, 4.7%, 4.3%, 4.9% and 4.8%, respectively. The values observed in this study were greater than those examined in the investigation of the impact of feeding forage in the form of either alfalfa silage (AS) or red clover silage (RCS), with or without additional fish meal (FM), on dry matter consumption, body weight gain and milk production as shown in Table (2). Clover silage combined with fish meal was 3.96% and 3.50%, respectively. Based on the investigation, cows that were fed on clover and sorghum stover had a much higher milk protein concentration. It was shown that cattle that were given alfalfa silage or had milk with a reduced protein composition compared to cattle that were given diets focused on corn silage and complemented with soybean meal.

**Table (2).** The impact of dietary interventions on dairy cattle milk content  
(Source: author)

Treatment	F-test	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>
Protein%	*	4.8 ±0.90 b	9.4±.32b	6.0 ±1.49a	4.9±0.60b	9.4±3.3b	5.2±0.70b
ASH%	*	0.28±0.13a	0.82±0.70b	0.74±0.12d	0.71±0.54c	0.63±0.12d	0.45±0.35d
T.S%	*	31.1±2.30b	13.4±1.90b	35.8±0.60a	14.9±1.5a	35.3±3.80a	14.9±1.20a
Moisture%	*	44.4±2.20a	44.6±2.80a	87.6±0.78b	87.1±1.6b	87.3±2.90b	51.0±2.30b
Parameter	*	6.3±0.41	6.3±0.350c	5.4±0.430b	5.7±1.30b	5.1±1.6b	4.5±2.40a
Fat% c	*	6.3±0.31	6.3±0.350c	4.7±0.330b	5.7±1.20b	4.8±1.5b	4.5±3.10a

Significant differences ( $p<0.05$ ) exist between the multiple subscripts inside each column.

C<sub>1</sub> and C<sub>2</sub> were supplemented with clover. C<sub>3</sub> and C<sub>4</sub> were maintained on a diet consisting of clover and sorghum stover. C<sub>5</sub> and C<sub>6</sub> were nourished with a diet consisting of clover and concentrate. Table (3) shows the overall performances.

**Table (3).** Overall of factors organization  
(Source: author)

Feed	Protein%	Ash%	Moisture%	TS%	Fat%
Clover	4.7 bc	0.73 a	88.63 a	13.37 c	4.72 c
Clover + Sorghum stover	4.8 a	0.68 b	87.38 b	14.66 ab	5.56 ab
Clover + concentrate	4.8 b	0.65 c	86.1 bc	15.83 a	6.71 a

Important variations ( $p < 0.05$ ) exist between the values in each column, as indicated by the various subscripts.

This finding demonstrates that there were no observed alterations in the milk proteins proportion when concentrate administration ranged from 1 to 4.6 kg DM/d, according to comparable investigation outcomes.

### Substantial component

There was a recognized disparity ( $p < 0.05$ ) in the amount of solid material compared to the categories.  $C_1$  and  $C_2$  had the lowest TS% values of 13.6 and 13.4, correspondingly, compared to  $C_3$ ,  $C_4$ ,  $C_5$  and  $C_6$ , which had TS% values of 14.7, 14.9, 14.7 and 14.9, respectively. Incorporating Sorghum stover or concentration into clover-based dairy diets resulted in enhanced milk total solids (TS). The higher milk production from the subsequent categories resulted in a considerable improvement ( $P < 0.05$ ) in the number of milk proteins when cows were fed a combination of clover with either sorghum stover or prioritize, compared to cattle fed clover separately.

### Amount of liquid

The investigation revealed a substantial disparity ( $p < 0.05$ ) in the moisture levels between the categories.  $C_1$  and  $C_2$  exhibited the maximum water content, measuring 90.9 and 89.9%, accordingly, compared to  $C_3$ ,  $C_4$ ,  $C_5$  and  $C_6$ , which recorded water contents of 87.6%, 89.3%, 87.1% and 86.6% respectively. No discernible variation was noted between the final categories.

### Dust percentage

The findings indicated a considerable disparity ( $p < 0.05$ ) between the categories. Clover 1 achieved the maximum percentage of 1.64, but clover 2 obtained a larger percentage of 21.62 compared to the other categories.  $C_4$  achieved a superior value than  $C_3$ ,  $C_5$  and  $C_6$ , with respective values of 1.54, 1.53 and 1.55. Insufficient material was located that could be used for comparison of experimental results or to provide an explanation for the greatest dust amount in milk from cows fed clover, which can be attributed to the high levels of magnesium (Mg) and potassium (K) elements present in clover.

## CONCLUSIONS

Finally, the act of providing clover as feed resulted in a minor inhibitory impact on dairy production. Supplementing clover with concentrate or sorghum stover resulted in a considerable enhancement in both milk productivity and milk substance. The inclusion of concentrated supplements in the feeding regimen of dairy cattle is contingent upon the quality of forage plants. As forage cannot adequately meet the nutritional needs of dairy cows due to its inadequate quality, the addition of concentrated supplements has been found to have a beneficial impact on milk yield and content. The decision about concentrate supplementation should consider the economic factors of feeding, such as the cost of adding concentrate compared to the resulting increase in milk production and overall profit. Furthermore, providing two distinct types of forage to dairy cattle resulted in superior outcomes in terms of milk production and fat content compared to supply one type of forage. It is advisable to utilize additional protein to sustain optimal milk production when incorporating clover forages into the diet of nursing cows. The performance of the method, such as Dairy production  $C_6$  of crossbred cows that fed clover and concentrate supplement was superior over other clover in milk yield (18.5 kg/ day). Dairy content ( $C_6$  (6.3 %)), Dairy protein ( $C_3$  6.0%), amount of liquid ( $C_1$  90.9% and  $C_2$  89.9%), Substantial component  $C_3$ , 4, 5, 6 showed a significant difference compared to other clover, dust content  $C_1$  has highest proportion. Dairy production and conditions in cattle can exhibit varying specific reactions, significant health hazards or adverse consequences, reliance on appropriate dosage, delivery and environmental considerations. By incorporating advanced technologies and executing investigations on genetic elements, we can improve outcomes and ensure the long-term viability of the milk business.

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