



Lucerne as Protein-Rich and Cost Effective Fodder for Livestock

(*S. R. Shri Rangasami¹ and R. Ajaykumar²)

¹Associate Professor (Agronomy), Department of Forage Crops, Tamil Nadu Agricultural University, Coimbatore - 641 003, Tamil Nadu, India

²Assistant Professor (Agronomy), Department of Agronomy, Vanavarayar Institute of Agriculture, Pollachi - 642 103, Tamil Nadu, India

*Corresponding Author's email: srshrirangasami@gmail.com

Lucerne (*Medicago sativa*), commonly known as alfalfa, is one of the most valuable forage crops worldwide, particularly revered for its high protein content and nutritional benefits. As a staple in the diets of various livestock, including dairy cows, beef cattle, sheep, goats, and horses, lucerne plays a pivotal role in animal husbandry, contributing significantly to the productivity and health of livestock.

Nutritional Profile and Benefits: The primary reason for lucerne's prominence as livestock fodder is its exceptional nutritional profile. Lucerne contains between 15% and 22% crude protein, which is significantly higher than many other forage crops. This high protein content is essential for supporting growth, lactation, reproduction, and overall health in livestock. Protein is a critical nutrient that contributes to the development of muscles, tissues, enzymes, and hormones in animals. In dairy cattle, for example, a diet rich in protein is directly linked to higher milk yields and improved milk quality.

In addition to its protein content, lucerne is rich in essential vitamins such as A, D, E, and K, and minerals like calcium, magnesium, potassium, and iron. These nutrients are vital for maintaining strong bones, proper metabolic functions, and overall vitality in animals. The calcium content in lucerne is particularly beneficial for lactating dairy cows, as it helps prevent conditions like milk fever, which can occur due to calcium deficiency.

Digestibility and Palatability: One of the key advantages of lucerne is its high digestibility. The fiber content in lucerne, primarily composed of cellulose and hemicellulose, is easily broken down by the digestive systems of ruminants, allowing for efficient nutrient absorption. This high digestibility not only ensures that animals receive the maximum nutritional benefit from their feed but also improves feed conversion rates, meaning that less feed is required to achieve the same level of productivity. Moreover, lucerne is highly palatable to livestock. Animals are naturally inclined to consume more of it, which further enhances their nutritional intake. This palatability is particularly important in scenarios where animals might otherwise be reluctant to eat, such as during periods of stress or when transitioning between different types of feed.

Forage Yield and Sustainability: Lucerne is a perennial crop, which means that it can be harvested multiple times a year, providing a consistent and reliable source of fodder. Under optimal conditions, lucerne can be cut three to four times annually, depending on the growing environment and management practices. This frequent harvest capability is a significant advantage for farmers, ensuring a steady supply of high-quality forage throughout the growing season.

Soil Health and Sustainability

Nitrogen Fixation: Lucerne, as a member of the legume family, has a remarkable ability to fix atmospheric nitrogen into the soil. This process is facilitated by symbiotic relationships with Rhizobium bacteria in its root nodules. These bacteria convert atmospheric nitrogen (N_2) into ammonia (NH_3), a form of nitrogen that plants can readily absorb and utilize. This natural enrichment of the soil with nitrogen significantly reduces the need for synthetic nitrogen fertilizers, which are not only costly but also have environmental downsides, such as contributing to greenhouse gas emissions and water pollution through runoff.

By improving the nitrogen content of the soil, lucerne enhances soil fertility and benefits subsequent crops planted in the same soil. This makes lucerne an integral part of crop rotation systems aimed at maintaining soil health and reducing chemical inputs, which are essential aspects of sustainable agriculture.

Soil Structure Improvement: Lucerne has a deep and extensive root system, often reaching depths of several meters. This deep rooting habit provides several benefits to soil structure and health:

1. **Enhanced Soil Aeration:** The penetration of lucerne roots into deeper soil layers creates channels that improve soil aeration, allowing for better gas exchange and root respiration. This is crucial for maintaining healthy root systems in crops.
2. **Increased Water Infiltration:** The root channels formed by lucerne also enhance water infiltration and reduce surface runoff. This means more water reaches deeper soil layers, improving water availability for crops and reducing the risk of soil erosion.
3. **Soil Stabilization:** The extensive root network of lucerne helps to bind soil particles together, reducing the likelihood of soil erosion by wind or water. This stabilization is particularly beneficial in areas prone to erosion, such as sloped lands or regions with heavy rainfall.
4. **Organic Matter Contribution:** As lucerne plants die and decompose, they contribute organic matter to the soil, further enhancing soil structure and fertility. This organic matter improves the soil's capacity to retain moisture and nutrients, creating a more resilient and productive environment for subsequent crops.

Versatility in Use: Another compelling feature of lucerne is its versatility in feeding systems. Lucerne can be fed to livestock in various forms, including fresh forage, hay, silage, or processed pellets. Each form offers distinct advantages depending on the specific needs of the farm or the livestock. For instance, fresh lucerne provides immediate nutritional benefits and is particularly useful during the growing season. Hay and silage, on the other hand, are excellent options for preserving the crop for use during the winter months or in regions where fresh forage is not available year-round. Pellets offer a convenient, easily transportable, and storable form of lucerne, which can be particularly useful in large-scale operations or in areas where fodder needs to be transported over long distances.

Environmental Benefits

Biodiversity: Lucerne fields are beneficial for promoting biodiversity, which is essential for maintaining a healthy and resilient ecosystem. The dense, leafy structure of lucerne plants provides an ideal habitat for various beneficial insects, such as pollinators (bees and butterflies) and natural predators of pests (ladybugs and spiders). These insects play critical roles in pollinating crops and controlling pest populations, reducing the need for chemical pesticides and enhancing the sustainability of the farming system.

In addition to insects, lucerne fields can support a variety of wildlife, including birds and small mammals, by offering shelter and food sources. The presence of these species within lucerne fields contributes to a more balanced ecosystem, where natural processes such as predation and pollination can occur more effectively. Furthermore, the cultivation of lucerne,

especially in a rotation system with other crops, can help break pest and disease cycles, further promoting plant health and reducing the need for chemical interventions. The diverse plant and animal life supported by lucerne fields also contribute to soil health by fostering a rich soil micro biome, which is essential for nutrient cycling and organic matter decomposition.

Economic Value

Cost-Effective Feed: Lucerne is highly regarded as a cost-effective feed option for livestock farmers due to its exceptional nutritional profile and ability to be harvested multiple times throughout the growing season. The high protein content, along with essential vitamins and minerals, makes lucerne nutrient-dense forage that meets the dietary needs of various livestock, including dairy cows, beef cattle, sheep, and goats. This nutrient density reduces the need for additional protein supplements, which can be expensive. By providing a balanced and high-quality diet with lucerne, farmers can enhance livestock health and productivity without incurring extra costs.

Moreover, the multiple harvests per year increase the overall yield of lucerne, allowing farmers to produce a significant amount of feed from the same plot of land. This high yield per acre, combined with the reduced need for supplemental feed, contributes to improved farm profitability. Farmers can allocate resources more efficiently, reducing feed costs and maximizing returns on investment in livestock production.

Conclusion

Lucerne stands out as an exceptionally valuable fodder crop for livestock, primarily due to its high protein content and rich nutritional profile. Its benefits extend beyond just animal nutrition, contributing to the sustainability of farming practices through its role in soil health and nitrogen fixation. The high digestibility, palatability, and versatility of lucerne make it an indispensable component of livestock diets, ensuring that animals receive the nutrients they need to thrive. For farmers, lucerne represents a reliable, sustainable, and highly productive forage option that supports both the economic and environmental aspects of livestock farming. As such, lucerne continues to be a cornerstone of efficient and sustainable livestock production systems around the world.

References

1. Carlier, L., Rotar, I., Vlahova, M., Vidican, R., Petkova, D., & De Vlieghe, A. (2008). The potential contribution of leguminous forage crops in sustainable cattle husbandry. *Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Agriculture*, 65(1).
2. Copani, G., Niderkorn, V., Anglard, F., Quereuil, A., & Ginane, C. (2016). Silages containing bioactive forage legumes: a promising protein-rich feed source for growing lambs. *Grass and Forage Science*, 71(4): 622-631.
3. Jones, R. A. Y. M. O. N. D. (1998). Bridging the protein gap: potential of forage crops for UK livestock production.
4. Rajan, K., Dinesh, D., Rashmi, I., Raja, P., & Ramesh, M. (2019). Prospective of tree lucerne in hilly areas for fodder, soil health and carbon sequestration: a review. *International Journal of Forestry and Horticulture*, 5(1): 1-6.
5. Rehman, S., Nizam, S., SaimaRubab, S. B., & Wei, X. (2023). Evaluation of Protein Content In Some Fodder Crops. *Hamdard Medicus*, 66(1).