

# Peanut Hay as a Non-Conventional Fodder Resource for Small Ruminants

Qamar Ud Din Usman\*, Zainab Samiullah, Assam Ali and Habiba Asif

Institute of Animal and Dairy Sciences, Faculty of Animal Husbandry, University of Agriculture Faisalabad, Pakistan

\*Corresponding Author: [qamarusman1100@gmail.com](mailto:qamarusman1100@gmail.com)

## ABSTRACT

Sheep and Goat production is one of the rapidly growing sectors in the livestock industry, fulfilling the country's demand for meat. The major factors affecting this industry are fodder shortage and economic losses due to traditional feeding expenses. To make the industry sustainable and economical, the use of Peanut hay offers a promising non-conventional fodder resource for small ruminants resulting in efficient productivity, growth performance, digestibility, and profit.

**Keywords:** Peanut hay, non-conventional food, Substitution for traditional hay

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### Introduction

Pakistan is an agricultural country that exhibits a strong agricultural dependency ratio in which the livestock sub-sector has a large contribution in agriculture surpassing the crop sub-sector. The agricultural sector contributed 22.9 percent in GDP, in which livestock having a share of 62.68 per cent in agriculture and 14.36 per cent in the total GDP. According to the economic survey of Pakistan (2022-23) meat (Mutton) production has increased from 765 thousand tons in 2020-21 to 799 thousand tons in 2022-23 [1]. In tropical arid areas of developing countries like Pakistan, sheep and goat farming depends heavily on natural pasture, providing a vibrant source of food and income for millions of small-scale and landless farmers, who depend on this enterprise for their livelihood [2]. Keeping in view the growth trend in small ruminant production, a sustainable supply of nutritious fodder is needed for the proper growth and development of livestock. Fodder crops are the cheapest and main source of feed for livestock production. There are two fodder scarcity periods in Pakistan, one in summer (May-June) and the other in winter (November-January) [3]. Ruminant livestock, particularly sheep, face significant challenges due to the shortage of high-quality food. Sheep primarily graze on substandard pastures, which are often nutritionally poor and overgrazed. Additionally, they are commonly fed with crop residues like rice straw, maize stover and wheat straw, which are low in essential nutrients like protein and energy. This reliance on low-quality forages, without adequate concentrate supplementation, hampers sheep productivity, leading to slower growth rates, reduced reproductive performance, and compromised overall health. In response to this ongoing forage shortage, recent research has focused on alternative feed resources to support sheep production [4]. One favorable option is the use of non-conventional fodder resources (not used as animal feed traditionally but has the potential to be used as feed) for optimizing the growth of animals and coping with the fodder lean periods of the year. A notable example is peanut hay, which is derived from the vegetative part of the annual peanut plant (*Arachis hypogaea L.*), a crop widely cultivated across irrigated and also arid regions of Pakistan (82,900 ha).

### Nutritional Profile of Peanut Hay

In smallholder, integrated crop-livestock farming systems, Groundnut (*Arachis hypogaea*) is one of the important crops for forage and seed production. Groundnut by-products or residues supply substantial quantities of feedstuffs to beef cattle, goats and sheep grown in the same region where peanuts are produced. In Pakistan, peanut hay and its by-products are present largely in Chakwal, Attock, and Rawalpindi. Many goat and cattle farmers are relying on peanut hay and its by-products and utilizing it as a non-conventional fodder resource. Moreover, leaves and stems from groundnut (peanut) contain a higher concentration of CP as compared to all fractions of residues from cereal crops e.g. millet, rice and maize [5]. Peanut hay, derived from the vegetative part of the annual peanut plant (*Arachis hypogaea L.*), serves as a valuable fodder source in small ruminants, it's a nutritious feed option for both sheep and goat, particularly during periods of pasture scarcity. Peanut hay is particularly beneficial for sheep diets due to its high crude protein (CP) content, ranging from 100 to 180g/kg DM, and its excellent organic matter (OM) digestibility, which ranges from 660 to 770g/kg in sheep. This makes it a highly nutritious option, especially during periods of pasture scarcity [6]. Furthermore,

peanut hay exhibits favorable mineral profiles, characterized by calcium (1.2%) and phosphorus (0.17%) levels, with relatively low fiber content (46.6%). These characteristics demonstrate the efficiency of locally offered peanut hay for promoting optimal growth and development performance and economic viability in small-scale sheep and goat farmers.

### Peanut hay substitution for traditional fodder

Peanut hay is a nutritious and sustainable alternative to traditional fodders like wheat straw, rice straw, maize, berseem and alfalfa, due to its potential to enhance the optimal growth performance of small ruminants. Pakistan is a country which has vast agricultural landscapes and climate variability due to which non-conventional feed resources (feeds that are not traditionally used in animal feeding but have the potential to be used as feed) such as peanut hay can play a major role in meeting the feed shortage [3].

### Peanut hay substitution for wheat straw

The alternative of wheat straw with peanut hay has been found excellent in increasing the nutritional intake and digestibility in small ruminants. Specifically, a study revealed increased intakes of dry matter (DM), neutral detergent fiber (NDF), and nitrogen (N), coupled with enhanced nutritional absorption of DM, NDF, and crude protein (CP). Nitrogen retention in the body also increased considerably with the substitution. This enhancement is attributed to peanut hay's superior nutritional profile as compared to wheat straw. Peanut hay contains higher levels of crude protein and lower levels of NDF.

Additionally, peanut hay is rich in calcium and phosphorus. The alternative of wheat straw with peanut hay facilitates higher consumption of DM, organic matter (OM), and NDF. Notably, dietary intake of all nutrients exhibits a sustained rises with escalating levels of peanut hay in the feed. Moreover, replacing wheat straw with peanut hay elevates rumen ammonia nitrogen. The high NH<sub>3</sub>-N availability, in cooperation with energy-dense fermentable cell walls in peanut hay, escalates microbial protein synthesis [7], contributing to raised nitrogen retention.

Overall, including peanut hay in sheep diets can maintain productivity throughout the year and increase productivity for smallholder farmers also from an economic point of view, mainly during periods of pasture scarcity. The study's results highlight the potential of indigenous peanut hay as a valuable resource for optimizing sheep nutrition. [6]

### Peanut hay substitution for Poor-quality natural forage

Peanut hay offers a possible alternative to poor-quality natural forage. Peanut hay can considerably enhance ruminant productivity. Studies examine the impact of peanut hay supplementation on feed consumption and nutrient digestibility in poor-quality natural pasture. Although the forage supplements increased digestibility, significant differences were only observed from peanut-supplemented diets. In association with poor-quality forage, peanut hay had higher nitrogen (N) and lower fibre content. Over 60% of the total nitrogen in poor-quality forage was associated with acid detergent fibre (ADF), whereas only 36% was associated with ADF in peanut hay. Peanut hay demonstrated 25% higher dry matter solubility and 79% higher solubility than poor-quality forage. The peanut hay diet showed higher organic matter (OM) digestibility.

Nitrogen retention was significantly improved with peanut hay supplementation, indicating efficient use of the high-quality forage supplement. This study confirms the benefits of forage supplements,

particularly peanut hay, in increasing nutrient intake when animals consume poor-quality forages, supplying rumen degradable nitrogen that is deficient in low-quality forages [8].

Research has shown that incomplete or complete substitution of poor-quality forage with peanut hay results in better feed intake, digestibility, and nitrogen balance in livestock. The addition of peanut hay into a small ruminant diet can mitigate nutritional deficiencies associated with poor-quality natural forage.

#### **Peanut hay substitution for Alfalfa**

Peanut hay may be the best alternative to traditional food like Alfalfa, especially during fodder scarcity periods, due to its palatability, higher digestibility, intake, nutritional profile and economics. In terms of energy, groundnut straw is comparatively superior to most of the grass hays [9].

Research shows that the feed intake of peanut hay was greater as compared to alfalfa hay in small ruminants. Moreover, research conducted in Florida and Georgia shows that perennial peanut forage is rich in nutrition for dairy, beef, and goats [10]. According to Gelaye et al. (1990) goats fed perennial peanut hay had greater digestibility of dry matter, fiber, and protein slightly than those fed with alfalfa hay in control group. Moreover, the goats voluntarily ate more peanut hay than alfalfa hay which tells about good palatability of peanut hay.

#### **Tips for feeding peanut hay**

Peanut hay is a highly palatable fodder with good digestibility and intake, but its digestibility can be reduced if it is fed with long particle size, due to the increased retention time in the rumen of the ruminants. Moreover, it may contain sand or dust in it that can result in refusal by the animals. So, it is advised to chop the peanut hay to reduce its particle size before offering it to the animals and to remove the dust in it, it is necessary to filter it with mesh or gauze, which will remove the dust. It can also be safely fed to the milch cows with wheat bran to meet the nutritional requirements.

#### **Conclusion**

Under the prevailing global problems like growing pressure of human population, decreasing area under fodder crops and low priority towards

fodder production, feed shortage or fodder scarcity is one of the great constraints in sustainable and profitable ruminant production by small-holder farmers. Rearing by traditional feeding cannot make a production system profitable. To cut short the feeding expenses, it is necessary to use non-conventional fodder resources as these resources have a great potential to play a major role in meeting the feed shortage in the years to come. In addition, other crops by-products that are not being currently used by the farmers as feed has a potential of inclusion in the rations of livestock. Based on the knowledge above, Peanut hay is a clear alternative to the discussed traditional feed resources. Peanut hay and its by-products are proven to have beneficial effects on growth performance, digestibility, dry matter intake, and nitrogen retention of small ruminants. However, for effective utilisation these fibrous feeds may need some chemical or physical treatments

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