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Impact of nitrogen application on fodder quality and yield parameters of oats: A review

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Abstract

The application of nitrogen to the oat crop has a major effect on plant height, growth, and leaf length all increased significantly after nitrogen was applied. The productivity and quality of fodder oat improves as nitrogen levels rise. Nitrogen application resulted in higher green and dry fodder yields, as well as improved green and dry fodder output efficiency and quality parameters such as ether extract, crude fibre. The current article was analysed in the view to investigate the impact of nitrogen fertilizer on oats.

Keywords: Nitrogen, growth of oats, fodder quality, yield

Introduction

Oats (*Avena sativa* L.) are a common winter cereal crop used for fruit, feed, and fodder around the world. It is a member of the Poaceae family and ranks sixth in the world's cereal production after wheat, maize, rice, barley, and sorghum. The majority of the oats provided around the world are used as a primary source of feed for livestock. Just 17 percent of grain is used as human food. The ever-rising demand for fodder and feed for sustaining placental mammal production is met through increasing productivity of fodder. According to the projected scenario, the imbalance in demand and supply of fodders require quick attention to establish appropriate strategies to close the gap. Because of its excellent growth habit, fast regeneration potential, and better palatability with more protein and minerals content, oats is the most important rabi season crop grown for animal food under irrigated conditions in the northern and north-western regions of India. In addition, it is used to make animal silage (Chakraborty *et al.*, 2016; Kumari *et al.*, 2014) ^[4, 5].

Nitrogen is used extensively by all crops in general, and non-legumes in particular. Nitrogen is a significant constituent of protein and chlorophyll in green plants, in addition to its other functions. Forage digestibility is calculated by a single index. However, because of crop lodging, a higher nitrogen dose is needed. Nitrogen is essential for fodder production since it is consumed in large quantities by the crop. A sufficient nitrogen supply is related to high photosynthetic activity, vigorous development, and a dark green colour in fodder, as well as being known to aid carbohydrate utilization and increase fodder juiciness. Nitrogen fertilizer is also the key element which influences yield and quality oat forage (Singh and Dubey, 2007; Subrahmanya *et al.*, 2017; and Yadav *et al.*, 2017) ^[1-3].

Effect on growth

Nitrogen is effect on plant height, leaf length, no of leaves, number of shoots. Singh *et al.* (2002) ^[6] studied highest plant height and number of tillers with N₈₀P₄₀ Kg ha application. Kumar and Ramavat (2006) ^[7] found that applying 100% of the recommended NPK (80-60-30 kg ha) resulted in more plant height and shoot number per unit area of oat over the course of all years than applying 75% of the recommended NPK dose. he application of nitrogen to fodder oats substantially increased growth and yields, according to Rawat and Agarwal (2010) ^[8]. Under 100 kg N ha, the maximum plant height and number of leaves per plant (103.3 cm and 25.7/plant, respectively) were reported. Midha *et al.*, 2015 found that applying nitrogen at a rate of 120 kg ha⁻¹ increased the height of oat plants from 89.9 to 126.8 cm. According to Godara *et al.* (2016), rising nitrogen levels from 40 to 120 kg/ ha had a substantial impact on all growth parameters. Wang *et al.* (2002) ^[11] reported that application of nitrogen to oats increased the dry matter by 71.9%.

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Effect of quality

The protein content of oats was substantially increased after nitrogen was applied. Waheed and his colleagues (2012.) In comparison to other treatments, inorganic sources (N: P₂O₅ 150:60) reacted well in terms of maximum crude protein (10.76%), crude fibre (37.00%), and ash (15.14%). Nitrogen content in fodder, hay, and straw, as well as in soil after harvest of an oats crop, was significantly affected by nitrogen levels, according to Devi *et al.* (2010) [14, 22]. During both years, nitrogen application increased the protein content of fodder, grain, and straw. Increasing level of N application in oats enhanced the ether extract and free amino acids (Kaur *et al.*, 2017) [15]. According to Jat and Kaushik (2018) [16], applying 110 kg N/ha improved quality parameters such as crude protein 1937.13 kg ha, crude fibre 5061.22 kg ha, ether extract 303.25 kg ha, mineral matter 1277.18 kg ha, nitrogen free extract 8877.58 kg ha, and total digestible nutrient 12595.7 kg ha. Crude protein yield increased significantly with the application of N @ 120 kg/ha (Bhilare *et al.*, 2007) [17].

Table 1: Typical Analysis

Dry matter	89%
Crude Protein	12%
Fat	04.5%
Crude fibre	12.0%
Neutral detergent fibre	28.5%
Acid detergent fibre	14.2%
calcium	0.07%

Source: National Grain & Feed Association

Yield Attributes

In terms of nitrogen amounts, the green fodder yield and dry fodder yield of fodder oats differed significantly. Low to moderate N values increased yield substantially, according to Mohr *et al.* (2007) [18], with an optimum relative yield achieved with a plant-available N supply of approximately 100 kg N ha. Increasing the N rate increased lodging and decreased test weight, kernel weight, and kernel plumpness, implying that optimal N management must strike a balance between yield improvement and grain quality reductions. Sharma *et al.* (2018) [19] found that the dry fodder yield was highest in oat when 80kg of nitrogen was applied per hectare. According to Mahale *et al.* (2003) [20], nitrogen application at 80 kg/ ha resulted in substantially higher green and dry fodder yields in oats. Significantly lower green fodder yield and dry fodder yield of fodder oats were observed with later sowing dates, which may be attributable to reduced photosynthetic activity as a result of unfavourable weather conditions prevailing during various stages of crops, which negatively affect fodder oats growth efficiency. Nawaz (2017) [21] observed that with application of N @ 150% of recommended dose, the fodder yield of oats increased to 60.90 t/ha. Mahmood *et al.* (2021) [13] reported that application of nitrogen @ 240kg/ha enhanced the growth and yield attributes of oats.

N, P and K uptake in fodder

When nitrogen is in an inorganic form, it is taken up by the oat plant. About 98 percent of the nitrogen in the soil is in an organic form that the oat plant cannot absorb. Nitrogen content in fodder, hay, and straw, as well as in soil after harvest of an oats crop, was significantly affected by nitrogen levels, according to Devi *et al.* (2010) [14, 22]. Preeti *et al.*

(2015) [23] found that applying nitrogen and phosphorus to oat fodder, grain, and straw substantially improved copper, manganese, and iron absorption compared to all other treatments.

Table 2: Micronutrient removal by Oats

Nutrient	Kg/t of Harvested grain, 100% Dry matter				
	Ca	Na	Mn	Zn	Fe
Grain	0.8	0.2	0.07	0.04	0.05
Grain plus straw	3.6	0.4	0.13	0.06	0.12

Source: <https://www.yara.co.uk/crop-nutrition/oats/oat-nutritional-summary>

Conclusion

All the growth parameters, yield attributes, yield, and quality parameters can be concluded from the above studies. In comparison to 40 kg N/ ha, 80 kg N per ha dose resulted in increased plant height, leaf length, and fodder yield. Green and dry fodder yields, as well as fodder production quality, crude protein, ether extract, and ash content, all increased after 120 kg N ha was applied.

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