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Effect of Cuttings and Nitrogen Level on Growth & Yield of Oat: A Review

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Abstract

Oat crop responds significantly to different application of nitrogen levels and cuttings. The split application of N on oat crop has majored impact on the plant height, weight of plant, tillers and other growth parameters. The split application of N improves the green fodder & dry fodder yield. The quality & productivity of fodder oat improves as N levels rise. The split application of nitrogen with double cut produced high yield due to high dose of nitrogen and various cutting. When yield was high, economics of oat crop automatically increased and single cut at 50% of flowering improves growth parameters. Highest gross returns, net returns and benefit cost ratio were found under double cut, (1st cut at 60days after sowing and 2nd cutat 50 percent of flowering).

Keywords: Oat; Cutting; Nitrogen; Growth and Yield Attributes

Introduction

Oat (*Avena sativa* L.) is the cool season cereal fodder crop. It is also known as "Javi" or "Jayi". It belongs to Poaceae family. Oats has 6th rank in world cereals production after wheat, maize, rice, barley, & sorghum crop. Oat crop is also known as multi cut ability and high yielding potential. They have possibility of re-growth & yield potential, both for fodder-productions & seed-productions, making a dual-purpose crop. Oat crop is grown in Rabi season. Oat is good source of fibre, minerals, and protein. Many parts of world, oat crop grown for grain purpose as well as for forage & fodder, straw also use for bedding, hey. Livestock grain feed is still the predominant use of crops. Generally, nitrogen is required for all crops and particularly in non- legumes crops. In addition to its other functions, the nitrogen is essential constituent of chlorophyll and protein in all green plants. Fodder desirability calculates by a single index. However, because of the crop-lodging, a high amount of N is required. N is important input for forage production because N is consumed in huge quantity by the forage crops. Cutting practice is the one of the key factors to influences growth of forage, yield of forage and its quality. Generally cutting management may fallow in forage crops provide high yield. As compare to single cut, double cut and multi cut crop absorb nutrients in high amount, which significantly influenced the

protein content, N content & further parameters based on quality of the crop. Cutting management is one of important factors influences the green and dry forage yield, because it plays important performance in biomass production. In oat crop, commonly two cuttings at different stage, but first cut at 60 days after sowing & at 50 per cent of flowering gave the better result of growth and yield Sharma A, et al. [1]. The cutting management, when crop harvest at 50% of flowering significantly increased leaf weight, leaf area index & also the dry matter production. Leaf area index significantly influenced with increase the level of nitrogen up to 160 kg/ha & dry matter yield up to 120 kg N/ha Bhilare RL [2].

Effect of Nitrogen Levels

- Effect on growth
- Effect on yield

Effect on Growth: Afzal M, et al. [3] conduct a trial to study to evaluate the effect of N on growth & yield of sorghum forage under three cutting system. The result revealed, the height of plant was 193.92cm, 195.24cm, 192.79cm in 1st, 2nd and 3rd cuttings, and maximum plant population 45.33 with 1st cutting. Alipatra A, et al. [4] conduct a field experiment about the study the growth, yield and quality of fodder oat as affected by split fertilizer application & cutting management. The result showed the maximum plant height (189.93 cm) were observed with application of 90 kg N ha^{-1} in three splits (half dose as basal + one fourth dose at 20 DAS + one fourth dose at 40 DAS). Midha LK, et al. [5] revealed a field trial study about the performance of promising entries of oats & effect of nitrogen levels. The result revealed that the application of 120 kg N ha^{-1} significantly enhanced plant height of oat ranging from 89.9 to 126.8 cm, tillers m^{-1} row length range from 68.6 - 88.1.

Godara AS, et al. [6] concluded a field experiment to study the effect of different nitrogen levels on forage yield, quality, and economics of oat genotypes. The result noted that the highest plant height 125.81 cm and the higher number of tillers 97.8 m^{-1} row length was obtained with the dose of 120 kg N ha^{-1}. Kumar BS, et al. [7] conducts a field trial to evaluate the effect of N levels and cutting management on growth, yield & quality of fodder oat (*Avena sativa* L). The result showed that the application of 160 kg N ha^{-1} significantly improved the growth characters like plant height, number of tillers, leaf stem ratio. Dubey S, et al. [8] investigated the effect of N & time of application on yield attributes, yield, and economics of fodder barley. The N levels were 0, 20, 40 & 60 kg N/ha. The result revealed the maximum number of spikelet/spike (9.48), spike length (8.94 cm) and number of grain spike-1 (26.88 cm) under the different application of 60 kg N/ha.

Devi U, et al. [9] conducted a field trial, study about the effect of N fertilizers on yield & quality of oats. The result showed that the uppermost plant height (103.3 cm) and leaves/plant (25.7) were observed with 100 kg N/ha. Nand V, et al. [10] conduct a field trial to evaluate the effect of fertilizers & cutting schedule on growth and quality of dualpurpose barley crop. The result showed that the highest plant height (67.03 cm), number of tillers (471.2 m^{-2}) & dry weight of plants (337.90g m^{-2}) were obtained with 120 kg N + 60 kg P_2O_5/ha. Islam MM, et al. [11] conduct a field trial to study the N fertilization on growth & yield response to oat. The result revealed that 105kg/ha nitrogen was superior in all growth character of like height of plant, number of leaves, number of tillers plant-1.

Pal V, et al. [12] conduct a field trial to study about the effect of different N levels on fodder quality & yield of oats. The result showed that the maximum height of plant (103.3 cm) and number of leaves plant-1 (25.7) were observed with 100 kg N ha-1. Pravalika Y, et al. [13] conduct a experiment to study about the effect of different levels of N application & cutting management on quality, yield and economics of fodder oat (*Avena sativa* L.). The result showed that the maximum height of plany (103.03 cm), number of tiller (77.45), leaf stem ratio (1.31) was recorded with the application of 150 kg N/ha. Patel GN, et al. [14] conduct an trial to evaluate the management of nitrogen levels & cut in rabi forage oat (*Avena sativa* L.). The result showed that the maximum plant height (102.5 cm), number of tillers/plant (5.8) and number of leaves/plant (45.5) were observed with 140 kg N/ha.

Effect of Nitrogen Levels on Yield: Alipatra A, et al. [4] conducted a field trial to study the yield, growth & quality of forage oat as affected by split applications of nitrogen fertilizer & cutting management. The result show the highest green fodder yield (5.59 qha^{-1} day-1) & dry matter yield (88.48 q ha^{-1}) were obtained with application of N in three splits (half dose as basal + one fourth dose at 20 DAS+ one fourth dose at 40 DAS). Midha LK, et al. [5] conducted an experiment to study about the performance of promising entries of oat under different N levels. The result discovered that application of N @120 kg ha-1 considerably enhanced the green fodder yield of oats from 253.4 to 416.1 q/ha and dry forage yield varied from 52.8- 89.2 q/ha.

Godara et al. [6] conduct a field trial to study the effect of different N levels on forage yield, quality, & economics of oat genotypes. The result revealed that the green forage yield (699.45 q/ha) and dry fodder yield (101.33 q/ha) was maximum under the application of 120 kg N ha^{-1}. Kumar BS, et al. [7] conducted a field trial to evaluate the effect of N levels and cutting management on yield, growth and quality of fodder oat (*Avena sativa* L.). The result exposed that the

split application of 160 kg N/ha obtained significantly highest N content than lowest dose. N content of the crop, plant enhanced considerably with the successive increment with N doses. Dubey S, et al. [8] investigated the effect of N and its time of application on yield, yield attributes and economics of fodder barley. The nitrogen levels were 0, 20, 40 & 60 kg/ha. The result discovered the maximum straw yield 37.6 qha^{-1} was observed with application of 60 kg N ha-1. Nawaz M [15] conducted three years program at soil salinity research institute of Pakistan to evaluate the effect of different sowing methods and nitrogen levels on fodder yield of oat in salt affected soil. The four N levels (75, 100, 125 and 150 kg ha^{-1}) were tested. The result revealed that the dose of 150 kg N ha^{-1} showed maximum fodder yield i.e., 60.9 t ha^{-1}.

Sharma V, et al. [16] investigates a field trial to evaluate the effect of different varieties & nitrogen on yield & quality of oat (*Avena sativa* L.). The result found that, the highest green fodder & dry fodder yield was observed with the split application of 80 kg N/ha with the variety Palampur-1. Application of 120 kg N/ha noticed the highest crude protein content at single cut. Sharma et al. [1] investigate a field trial to study about the performance of promising varieties of oat under different cutting regimes in mid hill conditions of Himachal Pradesh. The result found that the highest total green fodder (329 q ha^{-1}) & dry fodder (185 q ha^{-1}) yield were recorded with Palampur-1 harvest at 50 per cent of flowering period as compared to other varieties with various cutting management.

Islam MM, et al. [11] conducted a field trial to study the nitrogen fertilization on growth and yield response of oat. The result revealed that the maximum plant density 941.3 m^{-2} and straw yield (4.7 t ha^{-1}) were recorded with 105 kg ha-1 N application, whereas the highest grain yield (1.76 t ha^{-1}) was found with 90 kg ha^{-1} N. Pal V, et al. [12] conducted a field experiment to study the effect of different levels of nitrogen on fodder quality and yield of oats. The result discovered that the production and quality of fodder oats improved with 100 kg N ha^{-1}. Split application of nitrogen resulted in highest green fodder and dry fodder yield, as well as increased green forage output and dry fodder productivity efficiency and quality parameters viz., the ether extract.

Pravalika Y, et al. [13] conducted an experiment to study the effect of different level of N applications & cutting management on yield, quality & economics of fodder oats (*Avena sativa* L.). The result showed that the higher green fodderyield (584.8 q/ha) & dry fodder yield (95.4 q/ha) with application of 150 kg N/ha. Patel GN, et al. [14] conduct an fielf experiment to evaluate the nitrogen levels and cut in rabi forage oat (*Avena sativa* L.). The result showed that the high green forage yield (507 q/ha), dry matter yield (120q/ha) and leaf stem ratio (0.34) were observed with 140 kg N/ha.

Effect of Cutting Management

- Effect on growth
- Effect on yield

Effect of Different Cutting on Growth: Afzal M, et al. [3] conducted a field experiment to evaluate the effect of nitrogen on growth and yield of sorghum forage under three cutting system. The result revealed that the maximum height (195.24 cm), plant population (48.00) and number of leaves plant-1 (11.88) were observed with second cut. Alipatra A, et al. [4] laid out a field experiment on study the yield, growth & quality of forage oat as influence by different application of fertilizers & cutting management. The result showed that the highest plant height (189.93 cm) and leaf stem ratio (0.88) was obtained with C2 (double cutting at 60 DAS and105 DAS). Malik P, et al. [17] conducted a field trial to evaluate the effect of various cutting management schedules in oat crop. The result revealed that the highest height of plant was obtained when oats was cut at 70 days after sowing (65.9 cm) followed by cut at 60 days after sowing (53.8 cm) and then cut at 50 days after sowing (45.9 cm).

Nand V, et al. [10] conduct an field trial to evaluate the effect of fertilizers & cutting schedules on growth and quality of dualpurpose barley crop. The result showed that the maximum height of plant (77.28 cm), number of tillers (468 m^{-2}) and dry weight of plant (475 g m^{-2}) were obtained at 75 DAS. Pathan SH et al. [18] conducted an experiment to study about the effect of different cutting management on yield, growth & economics of dual-purpose oat, barley & wheat. The result reveales the maximum plant population 131.3 m and height of plant 92.7 cm with without cutting for fodder and left for grain only at harvesting time. The highest leaf stem ratio 1.82 with cut at 50 DAS for fodder and left for grain. Pravalika Y, et al. [13] conducted an experiment to study the effect of different level of N applications and cutting management on quality, yield & economics of fodder oat (*Avena sativa* L.). The result showed that the maximum height of plant (96.31cm), no of tiller (67.72) and leaf stem ratio (1.11) were observed with C1 (single cut at 50% of flowering stage). Patel GN, et al. [14] investigste a field experiment to evaluate the management of nitrogen level & cut in rabi forage oat (*Avena sativa* L.). The result showed that the highest height of plant (102.2cm), number of tiller (5.5), leaf area/plant (476.2 cm^2) and number of leaves/ plant (41.1) were obtained with cutting at 65 DAS.

Effect of Different Cutting on Yield: Alipatra A, et al. [4] laid out field trial to study about the growth, quality & yield of fodder oat as influenced by split applications of fertilizer and cutting management. Result showed that the highest green forage yield (5.59 q ha^{-1} day^{-1}) and dry matter yield (88.48 q ha^{-1}) were obtained with C2 (double cutting at 60 DAS

and105 DAS). Malik P, et al. [17] conducted an field trial to evaluates, effect of various cutting management schedule in oat crop. The result showed that maximum fodder yield was produced when crop wascut at70 days after sowing followed by cut at 60 days after sowing and least by 50days after sowing. Maximum yield of straw was obtained under cut at 50DAS (65.46 q/ha) closely followed by at 60DAS (63.68 q/ha) & minimum at 70DAS (55.40 q/ha).

Kumar BS, et al. [7] conducted a field experiment to studu about the effect of N level & cutting management on yield, growth and quality of fodder oat with five treatment of nitrogen levels and two cutting management. The result showed the double cut increased the growth, green fodder yield and quality. Sharma SK, et al. [19] investigate a field trial to study about the performance of promising varieties of oat under different cutting regimes in mid hill conditions of Himachal Pradesh. The result found that the cutting at 45cm height showed higher green fodder yield as compared to cutting at 60cm height and it was giving continues fodder supply with quality green forage yield. Thamer WK, et al. [20] conducted an trial to study about the effect of numbers of cutting time on yield component of oat cultivars and result revealed that the two-cut showed highest average of green forage yield (1300 kg ha^{-1}) and highest dry forage yield (222.2 kg ha^{-1}) was obtained.

Pathan SH, et al. [18] conducted an experiment to study about the effects of different cutting management on yield, growth, quality & economics of dualpurpose oat, barley & wheat. The result revealed that cutting at 70 DAS for forage production and left for grain record significantly higher green forage yield (39.3 t ha^{-1}), dry matter yield (7.12 t ha^{-1}) and yield of straw (9.40 t ha^{-1}) was significantly maximum in without cutting. Pravalika Y, et al. [13] conducted an experiment to study about, effect of different level of N applications & cutting management on yield, quality & economics of fodder oat (*Avena sativa* L.). The result showed that the maximum green fodderyield (655.12 q/ha) & dry matter yield (102.25 q/ha) found with C2 (1st cut at 60DAS & 2nd cut at 50% of flowering). Patel GN, et al. [14] investigate an experiment to evaluate the management of nitrogen level & cut in rabi forage oat (*Avena sativa* L.). The result showed that the highest leafstem ratio (0.30), green fodder yield (444 q/ha) & dry matter production (105 q/ha) were obtained with cutting at 65 DAS.

Economics

Effect of Nitrogen Levels: Jat RK, et al. [21] conduct a trial to evaluate the response of oats quality & economic to N & P level under north Gujarat agroclimatic condition. The result revealed that the split application of 125 kg N ha^{-1} recorded the maximum net profit (₹22695 ha-1) and benefit: cost (1.07) followed by the split application of 100 kg ha^{-1} N which provided net returns of ₹15279 and benefit cost ratio of 0.73. Godara AS, et al. [6] conducted a field experiment to study the effect of different nitrogen levels on forage yield, quality and economics of oat genotypes. The result showed the maximum gross returns (₹ 69945 ha^{-1}), net returns (₹ 41785 ha^{-1}) and benefit cost ratio (1.48) were recorded with application of 120 kg N ha^{-1}. Sharma v, et al. [16] conducted a field experiment to study the effect of varieties and nitrogen levels on yield and economics of oat. The result showed that the maximum green and dry fodder yield was associated under the dose of 80 kg N ha^{-1} with the variety Palampur.

1. Optimum quantity of nitrogen (80 kg N ha^{-1}) to oat varieties Palampur-1, Kent and JHO- 822 were provided net profit of ₹ 26413.8, ₹ 23255.3 and ₹19058 ha^{-1}.

Dubey S, et al. [8] investigated the effect of N & its time of applications on yield, yield attribute & economic of fodder barley and they found that the highest net return of ₹ 23593.88 ha-1 and B: C (1.04) was obtained with 60 kg N ha^{-1} was applied at sowing and 2/3 at first irrigation. Pravalika and Gaikwad [17] conducted an experiment to study about, effect of different level of N applications & cutting management on quality, yield & economic of fodder oat (*Avena sativa* L.). The result showed that the highest gross return (₹ 58483/ha), net return (₹ 31448/ha) and benefit cost ratio (2.12) recorded with the applications of 150kg N/ha. Patel GN, et al. [14] conducts an trial to evaluate the varying nitrogen levels and cut in rabi forage oats (*Avena sativa* L.). The result showed that the highest gross returns (₹76050/ha) and net returns (₹ 36643/ha) observed with applications of 140kg N/ha.

Effect of Different Cutting: Malik P, et al. [17] conducted the field trial to evaluate the effect ofvarious cutting management schedules in oat crop with three cuts at 50, 60 and 70 DAS. The higher fodder yield and plant growth was noticed when crop was cut at 70 DAS. Grains per panicle were recorded maximum (66.0) under 1st cut. Sharma A, et al. [1] investigated the field trial to study about the performance of promising varieties of oat under different cutting regimes in mid hill conditions of Himachal Pradesh. The result showed that the fodder cut at 50 per cent flowering resulted in highest net returns (₹ 35989/ha). Pathan SH, et al. [18] conducted an experiment to study about, effect of different cutting management on yield, growth, quality & economic of dualpurpose oat, barley & wheat. The result revealed that the highest gross return (₹ 63561/ha), net return (₹ 36128/ha) & benefit cost ratio (2.3) with cut at 50 DAS for fodder and left for seed.

Pravalika Y, et al. [13] conducted an experiment to study about, effect of different level of N applications & cutting management on quality, yield & economic of fodder oat

(*Avena sativa* L.). Result showed that the highest gross returns (₹ 6512/ha), net returns (₹ 36526/ha) & benefit: cost ratio (2.25) observed with C2 (1st cut at 60 days after sowing and 2nd cut at 50% flowering).

Patel GN, et al. [14] investigates an experiment to evaluate the management of nitrogen level & cut in rabi forage oats (*Avena sativa* L.). The result showed that the highest gross returns (₹ 66600/ha) & net returns (₹ 27630/ha) observed with cutting at 65 DAS.

Conclusion

All the growth parameters, green and dry fodder yield can be conclude from the studies. In comparisons to 25kg N/ha, 100kg N/ha dose results in increased the height of plant, plant weight, number of tiller, leaves/plant. Green fodder & dry fodder yield also increased after 100kg N ha^{-1} applied. Single cut at 50percent of flowering prove the best result in growth parameters Double cut, with (1st cut at 60 days after sowing & 2nd cut at 50 % of flowering) proved the best method for green & fodder yield & net realization on fodder oat.

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