Journal of Medicinal Plants Studies
www.PlantsJournal.com

ISSN (E): 2320-3862
ISSN (P): 2394-0530
NAAS Rating 2017: 3.53
JMPS 2017; 5(5): 33-35

Received: 07-07-2017
Accepted: 08-08-2017

Bollaveni Sathish Kumar
Department of Agronomy, Collage of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Raj Vir Singh
Professor, Department of Agronomy, Collage of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Adesh Singh
Assistant Professor, Department of Agronomy, Collage of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

BP Dhyani
Professor, Department of Soil Science, collage of agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Pooran Chand
Professor, Department of Genetics and Plant Breeding, collage of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Correspondence
Bollaveni Sathish Kumar
Department of Agronomy, Collage of Agriculture, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Effect of nitrogen levels and cutting management on economic studies of fodder oat (*Avena sativa* L).

Bollaveni Sathish Kumar, Raj Vir Singh, Adesh Singh, BP Dhyani and Pooran Chand

Abstract
A field experiment was conducted during *Rabi* season 2015-16 at Crop Research Centre (Chirauri) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.) to evaluate the effect of nitrogen levels and cutting management on performance of fodder oat and chemical properties of soil. The area lie at a latitude of 29º 40' North and longitude of 77º 42' East with an elevation of 237 meters above mean sea level. The soil of the experimental field was well drained, sandy loam in texture and slightly alkaline in reaction. It was medium in available nitrogen and phosphorus but high in available potassium with an electrical conductivity (1:2, soil: water suspension) of 1.6 dS/m. The treatments comprised 5 nitrogen levels (0, 40, 80, 120 and 160 kg ha^{-1}) and 2 cutting management (single at 50% flowering and double at 60 DAS and 50% flowering), replicated 4 times in a factorial randomized block design. The data on growth, physiology, green forage yield and quality and its contributing traits were calculated on net plot area basis (16 m^2), whereas content and uptake in straw along with soil available nutrients and production economic, were recorded as per the standard procedure. The results indicated that economic returns were superior at 160 kg nitrogen ha^{-1}. Likewise, single cut resulted into higher values of above mentioned parameter than double cutting (60DAS and 50% flowering).

Keywords: Nitrogen levels, cutting management, economic studies, *Avena sativa* L

Introduction
Livestock population is the largest in India comprising 182.50 million cattle, among these, 61.30 million buffaloes, 76.65 million goats, 41.30 million sheep, 10.0 million pigs and 3.04 million other animals. (Jat *et al*. 2014) [4]. India is having the largest livestock population, 15% of the world's livestock population (Neelar, 2011) [7]. Livestock contributing 7% to national GDP and source of employment and ultimate livelihood for 70% population in rural areas. Deficiency in feed and fodder has been identified as one of the major components in achieving the desired level of livestock production. At present, the country faces a net deficit of 63% green fodder, 24% dry crop residues and 64% feeds (Kumar *et al.* 2012) [6]. The productivity of our livestock often remains low due to inadequate and nutritionally unbalanced supply of feed and fodder. Half of the total losses in livestock productivity are attributed to the inadequacy in supply of feed and fodder.

Deficiency of green fodder will be about 64.9% and for dry fodders up to 24.9% in 2025 A.D. Under such circumstances the only way to bridge the gap between demand and supply of the fodder is to ameliorate the forage resources. Among forages, oat *(Avena sativa* L.) is an important winter feed and forage crop. Owing to its excellent growth habit, better regeneration capacity and good quality forage, it is a promising forage crop. Oat being rich in carbohydrates, vitamins, minerals and total digestible nutrients, is widely used as supplement, hay and silage.

Oat (*Avena sativa* L.) is the important cereal (*Gramineae*) and forage crop, grown during *rabi* season and is next to berseem in nutritive value. It is also rich in energy, protein, vitamin B, phosphorous and iron (Tiwana *et al.* 2008) [10]. It is cultivated in an area of 1021 million ha with an annual production of 233 million tons in the world (Anonymous, 2009) [1]. The total area covered under oat cultivation in India is about 1.0 million ha with 350-500 q ha^{-1} green fodder productivity (IGFRI, 2011) [3]. In India, it is grown in Punjab, Haryana, Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Madhya Pradesh, Rajasthan, Maharashtra and West Bengal. The crop occupies maximum area in Uttar Pradesh (34%) followed by Punjab (20%), Bihar (16%), Haryana (9%) and Madhya Pradesh (6%).

It is important winter crop in many parts of the world and is grown as multipurpose crop for grain, pasture, forage or as a rotation crop. Oat plant has excellent growth habit, quick recovery after cutting and good quality herbage. It is a palatable, succulent and nutritious crop. The protein quality of oat is excellent. Oat requires a long cool season for its growth; therefore, it is successfully grown in the northern plains and hilly areas of the country. Oat is mostly fed as green but surplus is converted into silage or hay to use during fodder deficit periods. Oat as a forage crop, has the advantage of being winter hardy and serves as catch crop.

There are several factors, which affect the productivity and quality of forage oat. Nitrogen is a one of the major component to influence the forage growth, yield and quality. Nitrogen play the vital role in the growth of fodder through the impact on cell elongation, cell division and inter-nodal expansion, it also play a major role in early establishment of the crop. Nitrogen is useful for the improvement of the leaf area by synthesis of enzymes and chlorophyll and also improves the leaf weight. Nitrogen improves the fodder yield through enhancement of growth parameters like plant height, number of tillers, leaf area index, number of leaves, leaf: stem ratio and dry matter accumulation. It is an essential part of protein and is a constituent of physiologically important compounds like nucleotides, vitamins, enzymes and hormones that promotes growth and development in crop plants (Kumar *et al*. 2001) [5] and also improve the meristematic activity, it is useful for absorbing of nutrients from the soil efficiently and enhance the protein content of the crop through improvement in synthesis of carbohydrates. Forage oat especially multi-cut oat cultivars are heavy feeder of nutrients and remove large amount of nutrients from the soil. Nitrogen availability to the plant directly influence the forage yield, it is the reason to provide the nitrogen with the split applications. Split application of nitrogen improves the availability of the nutrient to the crop and improves the nitrogen use efficiency. In general farmers use the nitrogen 120 kg ha^{-1} with improper doses in oat crop but nitrogen @160 kg ha^{-1} with split applications gave the higher yields than farmer practices (Chouhan *et al*. 2014) [2].

Cutting management is the one of the important factor to influence the fodder crop growth, yield and quality. In general cutting management may fallowed in fodder crops for higher yields. Cutting exhibits the effect on nutrient and natural resource utilization by the crop. As compared to single cut multi cut crops absorb more nutrients, which directly influence the nitrogen content, protein content and other quality parameters of the crop. Cutting is one of the main factor to influence the green and dry forage yield (Patel *et al*. 2013) [8], because it plays major role in biomass synthesis. In oat crop commonly gave two cuttings are at different stages, but 1st cut at 60 DAS and 2nd cut at 50% flowering gave the better growth and yield (Sharma *et al*. 2001) [9].

Materials and Methods

The field experiment was conducted at Crop Research Centre of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.) during *rabi* season 2015-16. The climate of this region is sub-tropical and semi-arid and climate characterized with summers and extremely cold winters. The mean maximum temperature of this region is about 43 ^{0}C to 45 ^{0}C is not uncommon during summer while very low temperature (1-2 ^{0}C) accompanied by frost may be experienced in December-January. The winters are cool; frost generally occurs towards the end of December and may continue till the end of January. The monsoon generally begins during the third week of June and desists by the end of September. The total precipitation and its distribution in this region various largely about 75 to 85% of it's received during July to September and few showers are also a common feature during the month of December to January and in late spring season. Mean weekly meteorological data for the season during experimentation period (2015-2016) based on observations collected at meteorological observatory of SVPUA&T, Modipuram, Meerut. Total precipitation of 211.30 mm was received during the experimentation period. The maximum temperature being 32.71 ^{0}C was recorded in 13th standard week. While, the minimum temperature was 8.57 ^{0}C in 51th standard week and the Relative Humidity ranged from 45.4 to 66.2% recorded, respectively in the morning. Ten treatment combinations comprising of five levels of nitrogen viz., 0 kg ha-1 N(N0), 40 kg ha-1 N (N1), 80 kg ha-1 N (N2), 120 kg ha-1 N (N3) and 160 kg ha-1 and two cuttings, single cut at 50% flowering stage and first cut at 60 DAS and second cut at 50% flowering. Oat seed were drilled by adopting a spacing of 25 cm. Kent cultivar was used in the study.

Cost of cultivation of crops was calculated treatment wise, on the basis of prevailing local market price of different inputs used in their cultivation. The monetary value of straw yield was computed in Rs/ ha^{-1} by using the local market prices for straw. The gross return was obtained by straw yield in Rs/ ha^1, treatment wise. The net return for each treatment was calculated by deducting the cost of cultivation from their respective gross returns. Benefit: cost ratio in terms of net return per rupee investment was calculated by using the following formula

$$B{:}C = \frac{\text{Net returns (Rs ha}^{-1}\text{)}}{\text{Cost of cultivation (Rs ha}^{-1}\text{)}}$$

Results and Discussion

Nitrogen levels and cutting management showed a clear effect on cost of cultivation, net returns and benefits. 160 kg N ha^{-1} gave better benefits than other lower doses. Benefit of the crop was significantly increased with increasing in successive nitrogen levels. Nitrogen 160 kg ha^{-1} gave the better cost benefit ratio (3.24) than lower doses with high yield and maximum returns. Comparatively lower doses nitrogen 160 kg ha^{-1} gave maximum grass (107100 Rs) and net returns (81869 Rs). Similarly cutting management also show the significant effect on net returns and benefits. Single cutting at 50% flowering gave high net returns (76693 Rs) and high B:C ratio (3.37%) with low cost of cultivation, higher yields and maximum gross returns. There was high labour consuming and high cost of cultivation in double cutting practice and comparatively double cutting gave lower yields, lower grass and net returns than single cutting practice. Double cutting gave the B:C ratio was 2.28 and which was comparatively very lower than single cutting at 50% flowering. Interaction of nitrogen 160 kg and single cutting at 50% flowering gave better gross, net returns and maximum cost benefit ratio.

Effect of nitrogen levels and cutting management on economic studies of fodder oat

Treatment	Cost of cultivation (Rs/ha^{-1})	Gross returns (Rs/ha^{-1})	Net returns (Rs/ha^{-1})	B:C ratio
Nitrogen levels (kg ha^{-1})				
N - 0	22475	73935	51460	2.28
N - 40	23405	84375	60970	2.60
N -80	24013	91140	67127	2.79
N -120	24622	98565	73943	3.00
N - 160	25231	107100	81869	3.24
Cutting management				
50% flowering	22742	99435	76693	3.37
At 60 DAS and 50% flowering	25157	82560	57403	2.28

Computation of value revealed that maximum economic feasibility *viz.,* gross return, net return and B: C ratio was found higher under N @ 160 kg ha^{-1}. The higher gross return was mainly due to fact that higher yield obtained by N @160 kg ha^{-1}, beside higher prevailing market price. While maximum net return may be due to lowest cost involved under this treatment, besides higher gross return. Moreover, maximum B: C ratio was due to the fact that higher net return under this treatment. Furthermore, a similar trend were obtained under single cut treatment which were mainly due to the fact that higher straw yield achieved over cutting at 60 DAS. Besides, lowest cost of cultivation involved under this treatment was mainly due to lower requirement of the labor.

Conclusion

Nitrogen with the 160 kg ha^{-1} given higher B:C ratio than other lower doses and cutting management also shows the significant effect. The single cut system was economically sound full than double cutting system. Single cutting system given higher B:C ratio than double cutting system.

References

1. Anonymous. Available in: <http://www.fao.org/statistical database> [accessed 24 5 2016], 2009.
2. Chouhan M, Gudadhe NN, Dinesh Kumar, Kumawat AK, Kumar R. Transplanting dates and nitrogen levels influences on growth, yield attributes, and yield of summer pearlmillet. The Biasean. 2014; 10(3):1295-1298.
3. IGFRI. Vision 2030: In: Pandey KC, Roy AK. (ed) Forage Crops Varieties. IGFRI, Jhanshi, India. 2011, 23-27.
4. Jat RK, Patel AG, Shviran A, Bijarnia AL, Bhunwal V. Response of oat (*Avena sativa* L.) on quality and economics to nitrogen and phosphorus levels under North Gujarat agro-climatic conditions. Journal of Crop and Weed. 2014; 10(2):492-494
5. Kumar A, Jaiswal RS, Verma ML, Joshi YP. Effect of nitrogen level and cutting management on yield and quality of different varieties of oat fodder. Indian Journal of Animal Nutrition. 2001; 18(3):262-266.
6. Kumar S, Agrawal RK, Dixit AK, Rai AK, Singh JB, Rai SK. Forage Production Technology for Arable Lands. Technology Bulletin. 2012; 39(9):255-260.
7. Neelar A. Response of oat genotypes to seed rate and nitrogen levels on forage yield and quality under irrigation. M.Sc. (Ag) thesis submitted to Department of Agronomy, University of Agricultural Sciences, Dharwad, India, 2011.
8. Patel TU, Arvadia MK, Patel DD, Thanki JD, Patel HM. Response of oat (*Avena sativa* L.) to cutting management and times of nitrogen application. Crop Reaserch and Research on Crops. 2013; 14(3):902-906.
9. Sharma SK, Bhunia SR. Response of oat (*Avena sativa* L.) to cutting management, method of sowing and nitrogen. Indian Journal of Agronomy. 2001; 46(3):563-567.
10. Tiwana US, Puri KP, Chaudhary DP. Fodder productivity quality of multicut oat grown pure and in mixture with different seed rates of sarson. Forage Research. 2008; 33(4):224-226.