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Impact of cutting and splitting of nitrogen doses on growth, yield and quality of fodder oat

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Abstract

A field experiment was conducted at Forage research field under All India Coordinated Research Project on (Forage Crops & Utilization) situated at College of veterinary science and Animal Husbandry, Kanke Ranchi (Jharkhand) to evaluate the effect of cutting and splitting of nitrogen levels on oat. Pooled of three years data showed that, the oat variety RO-19 recorded more plant height (104.58 cm), GFY (461.12 q ha⁻¹), DFY (90.91 q ha⁻¹), crude protein content (5.93), crude protein yield (5.38), crude fiber (46.25%), IVDMD (60.55%), Gross return (Rs 69,168 only), net return (Rs. 43,483 only) and B:C ratio (2.71).

While among the cutting and nitrogen management three cuts + 50% Basal + 25% at 1st cut + 25% at 2nd cut recorded some marginal better tillers per meter row length (111.78), green fodder yield (437.0 q ha⁻¹), DFY (85.91 q ha⁻¹) crude fiber (47.45%), crude fat (5.90%). With regards to economic Variety RO-19 with Two cut + 50% Basal+50% at 1st cut recorded better than other variety JHO-85 and UPO-212 with different combinations of cutting and nutrient management.

Keywords: Cutting interval, splitting of nitrogen, multi-cut oat, quality fodder limited irrigation condition

Introduction

Among the different Agricultural activities crop and livestock production is a key component of farming systems not only in India but also among South-East Asia and in Africa particularly with small and marginal farmers, estimated about 678 million, which indicates importance of livestock to their livelihoods (Anonymous, 2000). India with 2.4 per cent of the land and 4.0 per cent of water resources supports livelihood to 17.84 per cent of global human population as well as nearly 20 per cent of the world livestock.

Jharkhand faces pressure to feed the 32 million human and 3.42 per cent of national livestock population with just 2.42 per cent land of the country. In this state livestock is rearing over 0.12 per cent of fodder area and 0.95 per cent of grazing land and contributing equal percentage of fodder and milk (0.9%) yield in national pool with 180 g day⁻¹capita⁻¹ available milk for Jharkhand people against the 240 g day⁻¹ capita⁻¹ for national average (Anonymous, 2016). Thus, there is scope/need to grow green fodder during *Rabi* season under limited irrigation condition. Among the different *Rabi* fodder Oat has enough potential to survive dry condition and also perform well under assured irrigation. Cutting and nitrogen application are major components for optimum quality fodder production thus the experiment was laid out.

Materials and Methods

A Field experiment was conducted during *Rabi* season of three consecutive years 2019-20, 2020-21 and 2021-22 at Ranchi in the state of Jharkhand situated at 23°34' N latitude and 85°31' E longitudes at an altitude of 645.45 meter above the mean sea level. It falls under humid sub-tropical climatic conditions, which have features of hot dry summers and cool dry winters. The soil of the experimental field was sandy loam in texture, slightly acidic in reaction having different physical and chemical properties mentioned as organic carbon 3.84 g kg⁻¹ of soil, soil Ph 6.12, Available N 245 kg ha⁻¹, (Subbiah and Asija (1956) [9]. P₂O₅ 26.87 kg ha⁻¹ and K₂O 185 kg ha⁻¹ and water holding capacity 37.5%. The experiment was laid out in Split plot Design (SPD) having main plot three different varieties viz RO-19, JHO-85 and UPO-212 sub plot four combinations of cutting and nitrogen levels as Two cut + 60% Basal + 40% at 1st cut, Two cut + 50% Basal + 50% at 1st cut, Three cut + 50% Basal+25% at 1st cut + 25% at 2nd cut and Three cut + 40% Basal + 30% at 1st cut + 30% at 2nd cut. Above treatment were sown in plot size 4 m x 3 m and replicated thrice.

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Initially well decomposed Farm Yard Mannure @10 tons ha⁻¹ were applied. The recommended seed rate (RSR) for Oat: 80 kg ha⁻¹ with Recommended dose of fertilizer (RDF) - 80:40: 30 (N: P₂O₅:K₂O kg ha⁻¹ Rabi season during the crop period received very less rain fall which was occurred during early sowing stage i.e just after sowing. The post monsoon period (October to December) had a fair weather with gradual fall of temperature without rain. The pooled average of crop year the maximum and minimum temperature for crop were 23.43 °C and 6.85 °C, the relative humidity fluctuated from 85.9 to 37.1.

Crops were in good condition and irrigation and other Agronomical practices were made on time to reach their requirement for better growth and yield. Fodder were fertilized and harvested at proper time. Data on different parameters were collected and analyzed follow the standard formula prescribed by Cochran WG and Cox GM, 1957 [1].

Result and Discussion

Results on growth and yield are elaborated with proper discussion here under different sub head as-

Growth characters

Three years pooled data reflects that, among the growth characters tillers per meter row length (133.83), & taken 96.33 days to attain 50% flowering by Oat variety JHO-85, which were significantly more over other tested variety RO-19 and UPO-212, while RO-19 recorded significantly more plant height (104.58 cm). This was due to fact that distribution of photosynthate produced resulted into dry matter accumulation being converted in formation of tillers, attaining height and other

life survival activity. (Table 1). Kumar *et al.* (2001) [5] had also state the similar facts regarding development of tillers and corresponding height attend by the fodder oat.

In other hand combinations of nitrogen and cutting management, i.e, three cuts + 50% Basal+25% at 1st cut+25% at 2nd cut recorded slightly better in terms of tillers per meter row length (111.78), plant height (81.28 cm) over other combinations. Splitting of nitrogen improved nutrient use efficiency as well as less proliferation of weed. Raja, Waseem (2013) [6] also stated the same and advocated regarding cutting and splitting of nitrogen.

Fodder yield

Different oat varieties harvested as per cutting management, total yield of different cuts in year and accordingly pooled yield of three years in green as well as dry condition are presented in table 1. Results reflects that, Variety RO-19 yielded 461.12 q ha⁻¹ as green fodder & 90.91 q ha⁻¹ as dry fodder which were significantly more over other tested variety JHO-85 (394.39 & 78.0 q/ha) & UPO-212 (437.32 & 85.75 q ha⁻¹). This is due to combined effect of genetic potential of varieties coupled with effects of tillers as well as height. Joon *et al.* (1993) [2] also reported the same.

In other hand combinations of nitrogen and cutting management, i.e, three cuts + 50% Basal + 25% at 1st cut + 25% at 2nd cut recorded more GFY (437.00 q ha⁻¹) and DFY (85.91 q ha⁻¹). Number of cutting as well as splitting of nitrogen had no effect on GFY & DFY. Joshi, *et al.* (1997) [3] also advocated regarding splitting of nitrogen is essential for better growth as well as yield of forage oat.

Table 1: Effect of cutting and splitting of nitrogen doses on growth and yield of fodder oat cultivars. (3 years pooled)

Treatments	Tiller /m at harvest	Plant Height (cm)	Days of 50% flowering	Leaf: Stem ratio	GFY (q/ha)	DFY (q/ha)
Variety (V)						
RO-19	93.33	104.58	87.42	0.554	461.12	90.91
JHO-85	133.83	61.67	96.33	0.614	394.39	78.00
UPO-212	106.25	85.33	84.75	0.519	437.32	85.75
S.Em	0.87	0.50	0.38	0.006	2.01	0.31
CD at 5%	3.53	2.01	1.56	0.024	8.06	1.25
Cutting and splitting of N- management (N)						
Two cut + 60% Basal + 40% at 1 st cut	110.89	87.28	89.33	0.568	423.71	84.18
Two cut + 50% Basal + 50% at 1 st cut	110.67	84.39	89.44	0.57	429.45	84.77
Three cut + 50% Basal+25% at 1 st cut + 25% at 2 nd cut	111.78	81.28	89.44	0.567	437.00	85.91
Three cut + 40% Basal+30% at 1 st cut+30% at 2 nd cut	111.22	82.50	89.78	0.545	433.62	84.69
S.E m	2.34	1.56	0.41	0.07	4.34	0.82
CD at 5%	NS	NS	NS	NS	NS	NS
Interaction (VXN)						
S. Em	3.62	2.39	0.72	0.012	6.81	1.27
CD at 5%	NS	NS	NS	NS	NS	NS

Quality character

Among the different quality characters leaf: stem ratio and crude protein content and yield were calculated and presented at table 2. Results showed that, Variety RO-19 contains 5.93% crude protein and produced 5.38 q ha⁻¹ with leaf: stem ratio 0.55 which were more over other varieties under test Besides it three cuts + 50% Basal + 25% at 1st cut + 25% at 2nd cut recorded more CP content (6.22%) and CPY (5.30 q/ha).

Among the other quality parameter variety RO-19 recorded more crude fiber (46.25%), IVDMD (60.55%), while variety UPO-212 contains more crude fat (5.97%). In other hand cutting and splitting of nitrogen influenced the crude fiber, crude fat as

well as IVDMD. Among the different cutting and splitting of nitrogen as three cut + 50% Basal+25% at 1st cut+25% at 2nd cut recorded more crude fiber (47.45%), crude fat (5.90%), however, IVDMD decreased with the increased number of cutting and reduced dose of nitrogen at later cut. Two cut + 60% Basal + 40% at 1st cut recorded more IVDMD (62.34%) while same was lower under Three cut + 50% Basal + 25% at 1st cut + 25% at 2nd cut (57.38%). This is due to better nitrogen uptake and succulence of the variety. Singh and Dubey (2008) [8] stated regarding quality in terms of protein content of double cut fodder oat. They stated quality of fodder oat deteriorated as advancement of age and cutting of the fodder.

Table 2: Effect of cutting and splitting of nitrogen doses on quality and economics of fodder oat cultivars. (3 years pooled)

Treatments	Crude Protein		Quality parameter			Economics		
	Content (%)	Yield (q ha ⁻¹)	Crude fiber (%)	Crude fat (%)	IVDMD (%)	Gross return (Rs ha ⁻¹)	Net return (Rs ha ⁻¹)	B:C ratio
Variety (V)								
RO-19	5.93	5.38	46.25	5.71	60.55	69168	43483	2.71
JHO-85	5.56	4.34	44.66	5.67	59.54	59159	33474	2.31
UPO-212	5.14	4.40	45.25	5.97	58.56	65598	39913	2.57
S. Em	0.009	0.04	0.27	0.07	0.64	300	300	0.012
CD at 5%	0.037	0.15	1.23	0.28	NS	1208	1208	0.05
Cutting and splitting of N- management (N)								
Two cut + 60% Basal + 40% at 1 st cut	5.18	4.36	44.32	5.64	62.34	63556	39806	2.68
Two cut + 50% Basal + 50% at 1 st cut	5.87	4.98	44.66	5.61	60.14	64418	40668	2.71
Three cut + 50% Basal + 25% at 1 st cut+25% at 2 nd cut	6.22	5.33	47.45	5.90	57.38	65550	37930	2.37
Three cut + 40% Basal + 30% at 1 st cut+30% at 2 nd cut	4.90	4.16	46.01	5.87	58.32	65044	37424	2.36
S.E m	0.017	0.05	0.13	0.10	0.17	651	651	0.023
CD at 5%	0.05	0.15	0.39	NS	0.52	NS	1949	0.078
Interaction (VXN)								
S. Em	0.027	0.08	0.36	0.18	0.68	1021	1021	0.41
CD at 5%	0.084	NS	NS	NS	NS	NS	NS	NS

Economic

The economic study was made in terms of Gross return, Net return and B: C ratio. Table 2 showed that, the variety RO-19 recorded more gross return (Rs.69, 168 only), net return (Rs.69, 168 only) and B:C ratio (2.71) while, Two cut + 50% Basal + 50% at 1st cut recorded more net return (Rs.40, 668 only) and B: C ratio (2.71). Kumar *et al.* (1997) [4] and Sheoran, *et al.* (2002) [7] stated regarding better economic of oat up-to double cut.

Although GFY was more under three cuts while, better economic was recorded under two cut only due to cost of labour in third cutting which succeeded over third cuts yield.

Summery and Conclusion

In order to asses better combinations of varieties, with cutting and nutrient management experiment for three years was conducted and pooled /mean performance in terms of growth, yield, quality and economic were studied. Results summarized as oat variety RO-19 performed better growth, yield, quality and economic.

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