

## EFFECT OF NITROGEN LEVELS AND SEED RATE ON QUALITY OF RYEGRASS (*LOLIUM MULTIFLORUM*) IN ASSAM

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### SUMMARY

A field experiment was conducted at the Instructional-cum-Research (ICR) farm, Assam Agricultural University, Jorhat (Assam) during 2016-17. The PRG-1 variety of ryegrass (*Lolium multiflorum*) was tested at three seed rates and four nitrogen levels. The experiment was laid out in split-plot design in three replicates. The treatments consisted of three different seed rates in main plot viz., 10, 15 and 20 kg/ha along with four nitrogen levels viz., 0, 30, 60 and 90 kg N/ha in sub-plots. Results revealed that seed rates and nitrogen levels significantly effects ryegrass quality parameters. A seed rate of 20 kg/ha was found to be statistically superior in regards to quality parameters in all the three cuts viz. 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> cut as compared to seed rate of 15 kg and 10 kg/ha. The highest crude protein yield (6.21 q/ha) was obtained with seed rate of 20 kg/ha and was significantly superior to 15 kg/ha and 10 kg/ha. The crude protein content, crude fat content, crude fiber content of the ryegrass were also found to be significantly higher in seed rate of 20 kg/ha. In case of nitrogen levels application of 90 kg N/ha resulted in higher values in almost all the quality parameters. The highest crude protein yield (7.43 q/ha) was also obtained in 90 kg N /ha and was significantly superior to all other lower doses of nitrogen (60 kg and 30 kg N/ha). The crude protein content, crude fat content, crude fiber content of the ryegrass were also found to be significantly higher in nitrogen level of 90 kg N/ha.

**Key words :** Nitrogen level, seed rate, quality, crude protein, crude fiber, crude fat

India is the largest producer as well as consumer of dairy products which mainly comes from the livestock. The livestock population is primarily dependent on crop residues. Feeding the animals with quality fodder is a major challenge for the farmers. As a consequence the chronic shortage of feed and fodder resources indicate that most of the livestock are under fed. Such shortage on feed and fodder resources combined with to growing livestock population and less emphasis on forage cultivation by the livestock owners resulted in low productivity animals. Proper crop planning is a pre requisite for uninterrupted supply of nutritious green fodder for maintaining the higher productivity of dairy animals. Moreover, winter months are considered as the lean period for the fodder supply. So, growing winter forage is very important to cop up with fodder shortage during the lean period. Ryegrass (*Lolium spp.*) is cool season forage to feed the ruminant animals. It is fast germinating, quickly growing and requires low to medium fertilization. In

Assam, presently the oat is the only cereal fodder with green fodder production from two numbers of cuts. In view of this ryegrass is a suitable option as rabi forage crops which has numbers of merits over oat in respect of yield, productivity and quality. On the other side, there is good correlation between seed rate, plant population and increasing levels of nitrogen in relation to herbage yield. In view of this fact there is need to generate more research information on two important component technologies viz. suitable seed rate and nitrogen levels as this is a new forage crops for Assam. So, the present study has been undertaken to find out the proper seed rate in combination with suitable level of nitrogen dose to see the growth as well as green fodder yield potential of ryegrass.

### MATERIALS AND METHODS

As a whole the climatic condition of Jorhat (Assam) is sub-tropical humid in nature where

monsoon generally starts from November after sowing. During *rabi* season the highest rainfall receive on an average in the month of March while December and January received very scanty rainfall. The mean maximum temperature during the crop season in 2016 ranged from 24.0°C to 31.7°C, whereas the mean minimum temperature ranged from 8.0°C to 24.2°C, respectively. The average rainfall received during the crop season ranged from 0.0 to 115.9 mm. The average relative humidity in morning hours ranged from 90 to 100 per cent and in evening from 44 to 82 per cent. The important weekly weather parameters recorded at the Meteorological Observatory of the Department of Agricultural Meteorology, Assam Agricultural University, Jorhat during the period of experimentation have been showed graphically in Fig. 1. The experiment was laid out in split-plot design with thrice replication. The treatments consisted of three different seed rates in main plot *viz.*, 10 kg/ha, 15 kg/ha and 20 kg/ha along with four nitrogen levels *viz.*, 0 kg/ha, 30 kg/ha, 60 kg/ha and 90 kg/ha in sub-plots. Variety PRG-1 was used which is a promising ryegrass variety developed by the Punjab Agricultural University. It is a multicut cereal fodder and gives about three to four cuttings in *rabi* season. It is highly nutritious, palatable and easily digestible fodder crop. It is quick growing variety and its first cutting is ready in about 55 days after sowing and subsequent cuttings can be

taken after an interval of about 30-35 days. The sowing of the experiment was done on 12 November, 2016 and the fertilizers were applied one day ahead of sowing. Nitrogen was applied in 3 split doses *i.e.*,  $\frac{1}{2}$  of N is applied at final ploughing,  $\frac{1}{4}$  at 1<sup>st</sup> cut and remaining  $\frac{1}{4}$  at 2<sup>nd</sup> cut as per the treatment. All the phosphatic and potassic fertilizers were applied at the rate of 30 kg P<sub>2</sub>O<sub>5</sub>/ha and 30 kg K<sub>2</sub>O/ha through 187 kg/ha of SSP and 50 kg/ha of MOP, respectively.

## RESULTS AND DISCUSSION

### Quality Parameters

#### Crude protein content and crude protein yield

A perusal of the data on crude protein content of ryegrass showed that the maximum crude protein content at all the three cuts has been found in case of 90 kg application of nitrogen than the lower level, respectively (Table 1). Crude protein content is the function of per cent nitrogen content. There was better assimilation of N in the presence of higher levels of N resulting on increased protein synthesis. With regard to the effect of nitrogen on the percentage of crude protein of teff grass, it was found that increasing the level of nitrogen increased the percentage of crude protein (Adam, 2000). The crude protein yield which is the function of crude protein content and dry matter

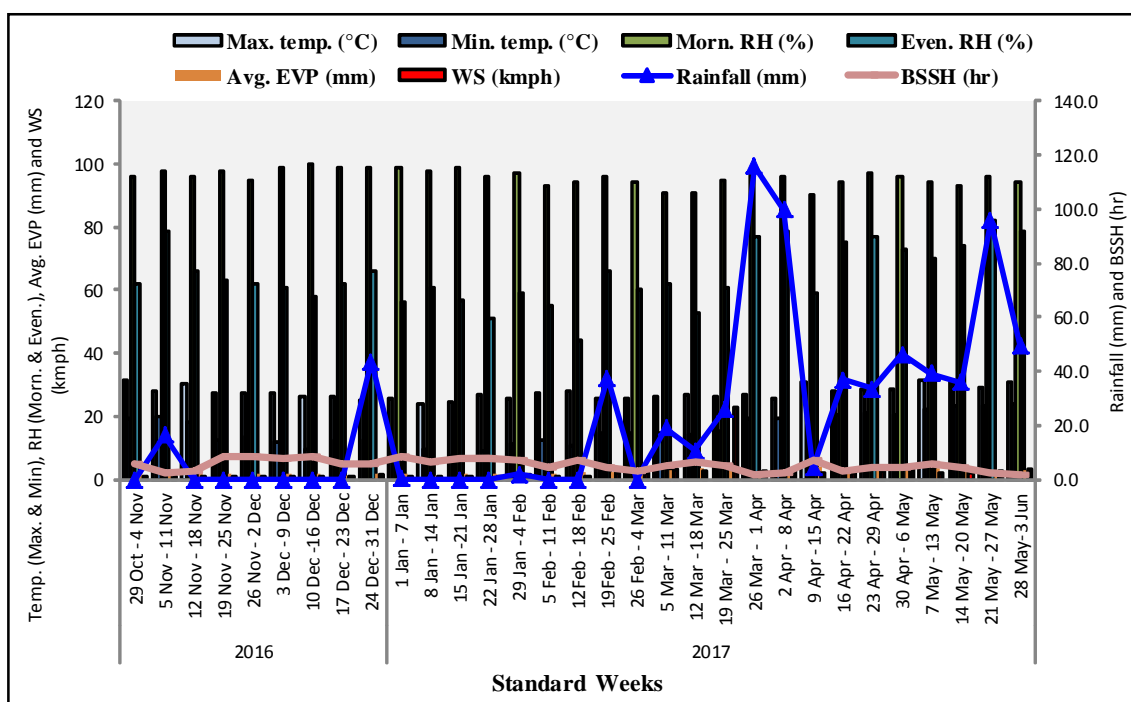


Fig. 1. Weekly weather data during the study (2016-17).

TABLE 1  
Effect of nitrogen levels and seed rate on crude protein (%) of ryegrass

Treatments	Crude protein (%)		
	1 <sup>st</sup> Cut	2 <sup>nd</sup> Cut	3 <sup>rd</sup> Cut
<b>Seed Rate (S) (kg/ha)</b>			
S <sub>1</sub> (10)	7.79	8.98	8.38
S <sub>2</sub> (15)	7.86	9.10	8.41
S <sub>3</sub> (20)	7.88	9.11	8.42
S. Em(±)	0.02	0.07	0.07
C. D. (P=0.05)	NS	NS	NS
<b>Nitrogen levels (N) (kg/ha)</b>			
N <sub>0</sub> (0)	6.86	7.95	7.34
N <sub>1</sub> (30)	7.77	8.94	8.26
N <sub>2</sub> (60)	8.14	9.44	8.73
N <sub>3</sub> (90)	8.44	9.52	8.80
S. Em±	0.06	0.08	0.07
C. D. (P=0.05)	0.18	0.24	0.25

yield was found to be highest in the highest level of nitrogen application (Table 2). The higher crude protein yield was obviously due to higher dry matter yield combined with higher crude protein content. Each increment of N produced significant increase in crude protein yield over the lower increment. Findings of the present study in conformity with Rai and Kanodia (1981) and Sarkar *et al.* (2007). Gasim (2001) also reported that the increase in nitrogen levels increased crude protein content and crude protein yield of maize.

Crude protein was significantly affected by seeding rate. It was found that increasing seed rate increases crude protein. Moreover crude fiber was significantly affected by seed rate. As seeding rate

TABLE 2  
Effect of nitrogen levels and seed rate on crude protein yield (q/ha) of ryegrass

Treatments	Crude protein yield (q/ha)			
	1 <sup>st</sup> Cut	2 <sup>nd</sup> Cut	3 <sup>rd</sup> Cut	Total
<b>Seed Rate (S) (kg/ha)</b>				
S <sub>1</sub> (10)	1.01	1.55	1.60	4.16
S <sub>2</sub> (15)	1.36	1.93	1.95	5.24
S <sub>3</sub> (20)	1.62	2.30	2.30	6.21
S. Em±	0.03	0.02	0.01	0.05
C. D. (P=0.05)	0.10	0.06	0.05	0.19
<b>Nitrogen levels (N) (kg/ha)</b>				
N <sub>0</sub> (0)	0.51	1.02	1.09	2.61
N <sub>1</sub> (30)	1.26	1.82	1.87	4.96
N <sub>2</sub> (60)	1.48	2.16	2.18	5.82
N <sub>3</sub> (90)	2.06	2.71	2.66	7.43
S. Em±	0.01	0.02	0.02	0.04
C. D (P=0.05)	0.04	0.05	0.07	0.11



Picture 1. Overview of the rye grass experiment.

increased crude fiber also increased (Adam, 2000). Protein content in forage decreased with increasing seed rate in forage sorghum (Abu Suwar *et al.* 1981). Abraha *et al.* (2015) observed that increase in nitrogen fertilization rates resulted in an increase in the crude protein content. The National research council (2001) recommended that forage with crude protein (CP) content of 15% or more will maintain high-producing dairy cows on grazed pastures. Abraha *et al.* (2015) in his research work on ryegrass concluded that higher irrigation coupled with high N application significantly improved the dry matter yield, while water stress, to some extent, did improve the quality of the pasture by increasing the dry matter content, in vitro organic matter digestibility, crude protein and metabolisable energy values.

### Crude fat content and crude fibre content

No significant differences have been found in case of crude protein due to the effect of seed rate treatments. However, the crude protein yield has been found higher in case of higher seed rate due to the higher dry matter yield in the respective seed rate. The interactive effect between nitrogen levels and seed rate was found to be statistically significant in case of crude protein yield due to the highest dry matter accumulation in the respective combinations. In case of crude fat content no significant differences has been found however in case of crude fibre content, higher fibre has been found in case of higher nitrogen levels and seed rate due to the higher population of ryegrass (Table 3 and Table 4).

### CONCLUSION

On the basis of one year field study, it was observed that ryegrass significantly responded to increased nitrogen levels and seed rate showing

TABLE 3  
Effect of nitrogen levels and seed rate on crude fat content (%) of ryegrass

Treatments	Crude fat content (%)		
	1 <sup>st</sup> Cut	2 <sup>nd</sup> Cut	3 <sup>rd</sup> Cut
<b>Seed Rate (S) (kg/ha)</b>			
S <sub>1</sub> (10)	3.56	3.66	3.84
S <sub>2</sub> (15)	3.55	3.63	3.83
S <sub>3</sub> (20)	3.60	3.70	3.88
S. Em±	0.01	0.01	0.01
C. D. (P=0.05)	NS	NS	NS
<b>Nitrogen levels (N) (kg/ha)</b>			
N <sub>0</sub> (0)	3.58	3.64	3.88
N <sub>1</sub> (30)	3.69	3.79	3.97
N <sub>2</sub> (60)	3.64	3.68	3.86
N <sub>3</sub> (90)	3.56	3.66	3.84
S. Em±	0.01	0.01	0.01
C. D. (P=0.05)	NS	NS	NS

TABLE 4  
Effect of nitrogen levels and seed rate on crude fibre content (%) of ryegrass

Treatments	Crude fibre content (%)		
	1 <sup>st</sup> Cut	2 <sup>nd</sup> Cut	3 <sup>rd</sup> Cut
<b>Seed Rate (S) (kg/ha)</b>			
S1 (10)	11.88	12.13	12.51
S2 (15)	12.06	11.94	12.24
S3 (20)	12.36	12.24	12.54
S. Em±	0.01	0.01	0.01
C. D. (P=0.05)	0.05	0.02	0.04
<b>Nitrogen levels (N) (kg/ha)</b>			
N0 (0)	11.48	11.36	12.07
N1 (30)	11.89	12.19	12.03
N2 (60)	12.31	12.22	12.72
N3 (90)	12.71	12.64	12.89
S. Em±	0.01	0.01	0.01
C. D. (P=0.05)	0.03	0.04	0.04

positive effect on all quality parameters like crude protein content (%), crude protein yield (kg/ha), crude fat content (%) and also crude fibre content (%). Application of 20 kg /ha seed rate and 90 kg N/ha has been found to be more productive and profitable in

ryegrass. Hence researchers need to do research in this field before drawing conclusion and put forward for recommendation to the farming community.

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