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PERFORMANCE OF PROMISING ENTRIES OF OAT (*AVENA SATIVA* L.) UNDER DIFFERENT NITROGEN LEVELS

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SUMMARY

Field experiment was conducted to study the performance of promising entries of oat and effect of nitrogen levels on yield and yield parameters. Results obtained from this experiment indicated that the significant and highest plant height (129.4 cm) was recorded by variety SKO-188 over all varieties of oat. However, lowest plant height (90.8 cm) of oat plant was recorded by variety OS-377. Maximum tillers of oat per row length (83.5) were recorded by two varieties viz., JO-03-97 and SKO-188 over all other varieties UPO-10-1, OS-377, JHO-10-2 and OL-125 (NC). Variety OS-6 (NC) recorded the highest green fodder yield of oat (401.3 q/ha) followed by JO-03-97 (385.6 q/ha) and least by OS-777 (299.7 q/ha). Variety OS-6 (NC) also recorded the highest dry fodder yield (82.8 q/ha) followed by UPO-10-2 (79.6 q/ha) and least by OS-777 (57.8 q/ha). Highest protein content (14.7%) in oat was recorded by variety JHO-10-2 closely followed by SKO-170 (14.6%) and least by JO-03-97. Whereas highest protein yield was recorded by variety SKO-170 (10.6 q/ha) and least by OS-777 (8.3 q/ha). Application of nitrogen @ 120.0 kg/ha significantly increased the oat plant height from 89.9 to 126.8 cm, tillers row length/m from 68.6 to 88.1, green fodder yield of oat from 253.4 to 416.1 q/ha, dry fodder yield from 52.8 to 89.2 q/ha, protein content from 11.9 to 13.6 per cent and protein yield from 6.3 to 12.1 q/ha, respectively, over 40.0 and 80 kg N/ha.

Key words : Nitrogen levels, plant height, tillers, green fodder yield, dry fodder yield, protein content, protein yield

In India, area under forage cultivation is about 4.4 per cent with an annual total forage production of 833 mt (390 mt green and 443 mt dry forage). Whereas the annual forage requirement is 1594 mt (1025 mt green and 569 mt dry) to support the existing livestock population. At present, the country faces a net deficit of 63 per cent green fodder, 24 per cent dry crop residues and 64 per cent feeds (Kumar *et al.,* 2012). Oat (*Avena sativa* L.), locally known as "jai", is an important non-legume, winter cereal crop, grown under irrigated conditions of northern and north-western regions of India because of its excellent growth characters, quick regrowth and economic source of dietary energy like other multicut fodders. It provides succulent and highly palatable fodder in two to three cuttings extending from December to February. Oat fodder can also be converted into hay or silage for feeding the animals during lean period. Like barley oat grain is also used in processed food like biscuit, etc. This food is low in saturated fat, and very low in cholesterol and sodium. It is also a good source of dietary fiber, thiamin, magnesium and phosphorus, and a very good source of manganese. The optimum rates of N application may play a vital role in improving yield of most crops. Almost all of the Haryana soils are deficient in available nitrogen and if sufficient amount of N required by crop is not applied to the crop then it may induce the deficiency into the fodder and grain. Since nitrogen is a constituent of amino acid and deficiency of nitrogen in grain and straw of the cereals as well as in fodder crops may cause severe disorder in animals and human beings. Therefore, we need to find out the proper dose of nitrogen for taking good yield of oat crop. Keeping above point in view, the field experiment was planned to study the performance of different promising entries /varieties of oat under different nitrogen levels.

MATERIALS AND METHODS

The field experiment was conducted to study

the performance of different promising entries under different levels of N in oat at the Forage Research Farm of Chaudhary Charan Singh Haryana Agricultural University, Hisar during **rabi** 2012-13. In all, 12 promising entries of oat were taken for the study. The soil of the experimental field was sandy loam in texture. Four representative soil samples were drawn from different places in the experimental field from 0-15 cm depth before sowing of experimental crop. Composite samples, prepared by passing through 2 mm mesh sieve, were analyzed.

RESULTS AND DISCUSSION

The detail of physical and chemical properties of the experiment along with the methods followed is given in Table 1. Three nitrogen levels (N_{40}, N_{80} and N_{120} kg/ha) were maintained. The green fodder was harvested 8-10 cm above the ground level as per treatment. Gross plot size was 5 x 3 m=15 m^2 and net plot size was 4 x 2.5 m =10 m^2. Experiment was laid out in split plot design by keeping three replications. The details of the treatments are given in Table 2. Nitrogen was applied through urea as per the treatments. All the field operations such as hoeing, irrigation, etc. were done as and when required. The harvested green fodder from each plot was weighed *in situ* in kg/plot and then converted into q/ha. A random sample of 500 g was taken from each plot at the time of green fodder harvest, chopped well and put into the paper bag. These paper bags were aerated by making small holes all over. The samples were first dried in the sun for several days and then transferred in an electric hot air oven for drying at a temperature of 60 ± 5^0C till constant weight. On the basis of these samples, the green fodder yield was converted into dry fodder yield q/ha.

Plant Height

Results (Table 2) indicated that the significant and highest plant height (129.4 cm) was recorded by variety SKO-188 over all varieties of oat followed by UPO-10-2 (118.0 cm) then closely followed by SKO-170 (117.6 cm) and JHO-10-1 (115.5 cm). However, lowest plant height (90.8 cm) of oat plant was recorded by variety OS-377. Application of 80 kg N/ha significantly increased the oat plant height from 89.9 to 102.6 cm over 40 kg N/ha and application of 120 kg N/ha further increased it to 126.8 cm over 80 kg N/ha significantly. Patel and Rajagopal (1998) also observed that application of nitrogen up to 75 kg/ha increased the plant height.

Tillers/m Row Length

Maximum tillers/m row length of oat (83.5) were recorded by two varieties viz., JO-03-97 and SKO-188 over all other varieties (Table 2). The differences between SKO-188, SKO-170, JO-03-97, JO-03-99, JHO-10-1 and OS-6 (NC) varieties were found non-significant with respect to numbers of tillers/m row length. The lowest number of tillers/m row length (66.4) was recorded by OS-777. Application of 80 kg N/ha significantly increased the number of tillers/m row length from 68.6 to 79.1 over 40 kg N/ha. Application of 120 kg N/ha recorded significant and highest number of tillers/m row length (88.1) over 40 and 80 kg N/ha. Patel and Rajagopal (1998) observed that application of nitrogen increased the number of shoots and leaves per metre row length.

Green Fodder Yield

Data (Table 2) revealed that variety OS-6 (NC)

TABLE 1
Physical and chemical properties of soil of experimental field before sowing of oat

Property	Values	Method used
Sand (%)	60.48	International Pipette Method (Piper, 1966)
Silt (%)	18.90	
Clay (%)	20.62	
Organic carbon (%)	0.35	Walkley and Black (1934) wet oxidation method (Jackson, 1973)
Soil pH	7.6	Glass electrode pH meter (Jackson, 1973)
EC (dS/m at 25°C)	0.18	Conductivity bridge meter
Available nitrogen (mg/kg)	86.0	Alkaline permagnate method (Subbiah and Asija, 1956)
Available phosphorus (mg/kg)	7.15	Olsen's method (Olsen *et al.*, 1954)
Available potassium (mg/kg)	132.15	Flame photometer method (USDA Hand Book No. 60

TABLE 2
Performance of different promising entries of oat and effect of nitrogen levels on yield and yield parameters in oat

Entries	Plant height (cm)	Tillers row length/m	Green fodder yield (q/ha)	Dry fodder yield (q/ha)	Protein content (%)	Protein yield (q/ha)
JO-03-97	110.4	83.5	385.6	76.2	11.6	8.8
JO-03-99	100.7	82.8	325.9	70.4	12.0	8.4
UPO-10-1	96.5	76.7	309.7	68.5	13.1	8.9
UPO-10-2	118.0	79.9	341.5	79.6	11.9	9.5
SKO-188	129.4	83.5	374.4	66.9	12.4	8.3
SKO-170	117.6	80.2	343.6	72.5	14.6	10.6
OS-377	90.8	66.4	299.7	57.8	11.8	6.8
JHO-10-1	115.5	80.1	340.4	71.3	12.5	8.9
JHO-10-2	100.8	73.9	308.5	68.8	14.7	10.1
Kent (NC)	92.5	79.5	335.4	77.0	11.8	9.1
OS-6 (NC)	101.3	81.3	401.3	82.8	13.7	11.3
OL-125 (NC)	109.8	74.8	353.7	71.4	12.6	9.0
C. D. (P=0.05)	8.5	5.9	21.7	6.6	-	-
Nitrogen levels (kg/ha)						
40	89.9	68.6	253.4	52.8	11.9	6.3
80	102.6	79.1	360.5	73.5	12.7	9.0
120	126.8	88.1	416.1	89.2	13.6	12.1
C. D. (P=0.05)	6.9	4.8	17.4	5.1	-	-

recorded the highest green fodder yield of oat (401.3 q/ha) followed by JO-03-97 (385.6 q/ha), then by SKO-188 (374.4 q/ha) then OL-125 (NC) (353.7 q/ha) and least by OS-777 (299.7 q/ha). Application of 80 kg N/ha significantly increased the green fodder yield from 253.4 to 360.5 q/ha over the treatment 40 kg N/ha. Application of 120 kg N/ha recorded significant and highest green fodder yield of oat (416.1 q/ha) over 40 and 80 kg N/ha. Singh and Dubey (2008) also revealed that an application of nitrogen up to 80 kg N/ha significantly increased the growth and produced 493 and 98.75 q/ha green and dry fodder yield, respectively.

Dry Fodder Yield

Data (Table 2) revealed that variety OS-6 (NC) recorded the highest dry fodder yield (82.8 q/ha) followed by UPO-10-2 (79.6 q/ha), then Kent (NC) (77.0 q/ha) then closely followed by JO-03-97 (76.2 q/ha) and least by OS-777 (57.8 q/ha). Application of 80 kg N/ha significantly increased the dry fodder yield from 52.8 to 73.5 q/ha over the treatment 40 kg N/ha. Application of 120 kg N/ha recorded significant and highest dry fodder yield of oat (89.2 q/ha) over 40 and 80 kg N/ha. Singh and Dubey (2008) also revealed that an application of nitrogen up to 80 kg/ha significantly increased the growth and produced 493 and 98.75 q/ha green and dry fodder yields, respectively.

Protein Content

Data (Table 2) indicated that highest protein content (14.7%) in oat was recorded by variety JHO-10-2 closely followed by SKO-170 (14.6%), then by OS-6 (NC) (13.7%), UPO-10-1 (13.1%) and least by JO-03-97 (11.6%). Application of N increased the protein content in oat and this may be due to the reason that nitrogen helps in the synthesis of amino acid and protein in plant. The increase in protein content was from 11.9 to 12.7 with the application of 80 kg N/ha over 40 kg N/ha. Protein content of oat plant further improved from 12.7 to 13.6 per cent with the application of 120 kg N/ha. Higher content of protein at 120 kg N/ha was attributed to more uptake of nitrogen which is constituent of amino acids and protein. Rana *et al.* (2009) and Devi *et al*. (2010) also reported the similar results.

Protein Yield

Data (Table 2) indicated that highest protein yield was recorded by variety by OS-6 (NC) (11.3 q/ha) followed by SKO-170 (10.6 q/ha) then closely followed by JOH-10-2 (10.1 q/ha) then by Kent (NC) (9.1 q/ha) and least by OS-777 (8.3 q/ha). As in case of protein

content, protein yield of oat also increased with the application of N and increase was from 6.3 to 9.0 with 80 kg N/ha over 40 kg N/ha. Application of 120 kg N/ha recorded the highest protein yield (12.1 q/ha) over 40 and 80 kg N/ha.

CONCLUSION

Based on the results of present study, it may be concluded that entry/variety OS-6 (NC) performed better than other entries with respect to green and dry fodder yield. In case of protein content, entry JHO-10-2 performed better than other entries. Application of nitrogen significantly increased the green and dry fodder yield as well as protein content and protein yield up to the dose of 120 kg N/ha over 40 and 80 kg N/ha.

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