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Effect of Fertilizer on the Growth of Local Aromatic Rice Varieties

Kamrun Nahar Mousomi[1*], Md. Abul Kashem[2], Mohammad Noor Hossain Miah[3] and Imtiaz Miah[1]

[1]Department of Agricultural Chemistry, Sylhet Agricultural University, Sylhet-3100, Bangladesh.
[2]Department of Soil Science, Sylhet Agricultural University, Sylhet-3100, Bangladesh.
[3]Department of Agronomy and Haor Agriculture, Sylhet Agricultural University, Sylhet-3100, Bangladesh.

Authors' contributions

This work was carried out in collaboration between all authors. Author KNM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MAK and MNHM supervised experimental procedure and edited final manuscript. Author IM managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

A pot experiment was conducted at the experimental net house of the Department of Soil Science, Sylhet Agricultural University, Sylhet, Bangladesh to observe the effect of fertilizers on growth of local aromatic rice varieties during the aman (summer) season of 2015. The experiment was laid out in a Randomized Complete Block Design with three replications. Five aromatic rice varieties (Kalizira: V_1, Muktasail: V_2, Nagrasail: V_3, Maloti: V_4 and Chinigura: V_5) and four levels of fertilizer (Recommended dose: F_1 i.e. 45-10-20-10-0.5 kg ha^{-1} of N-P-K-S-Zn, 2/3rd of recommended dose: F_2, 1/3rd of recommended dose: F_3, and Control: F_4) were used. All fertilizers were applied as basal during final pot preparation while urea was applied in two equal splits. With few exceptions, all of the growth characters of the aromatic rice varieties were significantly affected due to the application of different fertilizer doses. The longest plant (124.5 cm) at harvest was found in Muktasail with

**Corresponding author: E-mail: nahar.mousomi@gmail.com;*

recommended dose of fertilizers whereas the shortest plant (91.40 cm) was noted in Kalizira variety in control treatment. Similarly, recommended dose of fertilizers gave the highest tillers number hill^{-1} (25.00) in Kalizira at and the lowest number of tillers hill^{-1} (8.67) was noticed in Chinigura variety at control treatment. The highest grain yield was recorded in Nagrasail variety (65.33 g pot^{-1}) followed by Kalizira (65.26 g pot^{-1}) with recommended dose of fertilizers while the lowest yield (24.31 g pot^{-1}) was observed in Maloti in control treatment. The overall results indicated that recommended dose of fertilizers influenced the growth characters of aromatic rice varieties.

Keywords: Aromatic rice; fertilizer dose; growth; summer.

1. INTRODUCTION

Bangladesh is primarily an agriculture based country. Agriculture is the single largest producing sector of economy since it comprises about 17% of the country's GDP and employs about 45% of labour forces [1]. Aman rice is the second largest crop in the country in respect of volume of production [1]. According to the coarseness of grain, there are two types of transplanted aman rice in Bangladesh viz. coarse and fine grain rice and most of the fine grain rice varieties are aromatic. Locally cultivated aromatic rice in Sylhet region of Bangladesh are Chinigura, Kalizira, Chinirsail, Gandi, Muktasail, Mikrisail, Nagrasail, Bantos, Maloti etc. Although the production of aromatic rice per unit area is lower than the ordinary rice but the farmers are getting more price than ordinary rice. Due to their aroma, taste and high demand, there is a market of aromatic rice not only in Bangladesh but also throughout the world. Only for this reason the farmers are showing interest regarding the cultivation of aromatic rice and the area under aromatic rice is increasing day by day [2]. Managing plant nutrients to increase the crop yield is a very critical aspect. The nutrients that play a direct role in the growth and yield of rice are N, P, K, S and Zn. It is very important to apply these nutrients in an efficient way to minimize loss and to improve the nutrient use efficiency. But our farmers use of imbalanced or excess fertilizer to maintain yield levels. It directly affects the crop growth resulting poor yield. However, balanced fertilization has played an important role in increasing the rice yield. The growth character e.g. plant height and tiller number directly influence to the yield of aromatic rice. With the aim of judicious nutrient supply from fertilizers for profitable aromatic rice production, the present study was carried to evaluate fertilizer responses of five aromatic rice varieties on growth characters that affect the yield.

2. MATERIALS AND METHODS

The experiment was conducted at the experimental net house of the Department of Soil Science of Sylhet Agricultural University, Sylhet, Bangladesh during Aman (Summer) season of 2015. The location of the site was 24.91° N latitude and 91.90° E longitude and elevation of 30 m from the sea level (Google Earth, 2014). During the experimental period (July 1, 2015 to December 04, 2015) the maximum temperature was recorded 33.0°C, minimum 14.7°C and the mean monthly relative humidity was 73.33%. Heavy rainfall occurs during first three months. The soil belongs to the "Pritim Pasha" Soil series of Northern and Eastern Piedmont Plains (Agro Ecological Zone-22). Different chemical properties of initial soil i.e. soil pH (4.97), soil organic carbon (0.90%), soil organic matter (1.56%), total N (0.089%), available P (6.5 mg kg^{-1}), exchangeable K (0.14 meq 100 g^{-1} soil), available S (17.67 mg kg^{-1}) and available Zn (0.137 mg kg^{-1}) were recorded. The experiment comprised of five local aromatic rice varieties (Kalizira: V_1, Muktasail: V_2, Nagrasail: V_3, Maloti: V_4 and Chinigura: V_5) and four levels of N-P-K-S-Zn fertilizer as F_1: Recommended dose (4900-3000-2100-3300-75 mg pot^{-1}), F_2: 2/3rd of recommended dose (3260-2000-1400-2200-50 mg pot^{-1}), F_3: 1/3rd of recommended dose (1630-1000-700-1100-25 mg pot^{-1}), and F_4: Control (no fertilizer application). According to Fertilizer Recommendation Guide-2012 [3], the recommended fertilizer dose of the experiment was 45-10-20-10-0.5 kg ha^{-1} of N-P-K-S-Zn, respectively for aromatic transplant aman rice. Urea, TSP, MoP, gypsum and $ZnSO_4$ were used as N, P, K, S and Zn sources, respectively. All the fertilizer doses were calculated for upper 10 kg soil in each pot. Total number of treatment combinations was 20. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Total 60 pots were used having the size of 45.72 cm × 45.72 cm (18´´×18´´). Each pot was filled up with 45 kg

field soil. All fertilizers were applied to the individual pot during final pot preparation according to the treatments used. Each fertilizer was applied separately to the soil surface and then mixed to soil by applying flood irrigation in pot. Urea was applied in two equal splits (one half as basal and another half at 40 DAT). The spacing of transplanting was 18 cm × 18 cm. The 30 days old seedling of aromatic rice varieties were transplanted on 7th August 2015 and harvested from 01 to 04 December 2015. Cultural operations such as weeding, irrigation, pest control etc. were done as and when necessary. Regular flood irrigation was applied in pots during plant growth. The plant height (cm) and number of tillers hill^{-1} was recorded for growth parameters. Data were recorded with 15 days interval starting from 15 DAT up to 75 DAT and at harvest. The plant height was measured from the ground level to the tip (either it was panicle and or the longest leaf). Total number of tillers in every four hill of each pot were measured and averaged. The statistical analyses of the growth data was done by using computer package program (MSTAT-C) and the means were separated using Duncan's Multiple Range Test (DMRT).

3. RESULTS AND DISCUSSION

3.1 Plant Height

Plant height at 15, 30, 45, 60 and 75 DAT and at harvest showed significant variations among five rice varieties (Table 1). The highest plant height (47.26 cm) at 15 DAT was observed in Maloti while the lowest was (42.09 cm) in Nagrasail. Maloti produced the longest plant at 30 and 45 DAT (80.96 and 84.49 cm, respectively). After that Muktasail was recorded to have the highest plant height and the values were 108.6, 116.1 and 116.9 cm at 60, 75 and at harvest, respectively. The lowest plant height was observed in Muktasail (72.21 cm) at 30 DAT. At 45 DAT, 60 DAT, 75 DAT and at harvest, Kalizira possessed the shortest plant and the values were 80.38 cm, 91.09 cm, 104.8 cm and 102.6 cm, respectively.

Different fertilizer doses applied as F_1, F_2, F_3 and F_4 also showed significant effects on plant height at 15, 30, 45, 60 and 75 DAT and at harvest (Table 2). In every observation, the highest plant height was recorded at recommended dose of all fertilizers (F_1) and control treatment produced the shortest plant. The longest plants at 15, 30, 45, 60 and 75 DAT and at harvest were 50.29, 80.25, 87.09, 108.4, 121.2 and 120 cm, respectively and the shortest plant were 37.70, 68.72, 78.14, 90.30, 99.67 and 101.4 cm, respectively.

There was significant interaction between fertilizer doses and rice varieties on plant height at 15, 30, 45, 60 and 75 DAT and at harvest (Table 3). At 15 DAT, Maloti produced the highest plant height (55.49 cm) with F_1 dose of fertilizer applying in soil and Muktasail had the lowest height (32.89 cm) in no fertilizer i.e. control treatment. The longest plant (88.75 cm) was also found in Maloti variety at 30 DAT with recommended dose of fertilizer (F_1) whereas Kalizira with control showed the shortest plant (62.39 cm). Maloti had the highest plant height (92.35 cm) till at 45 DAT with the application of recommended dose of fertilizer in soil and Kalizira also continued to produce the lowest plant height (75.52 cm) with F_4 treatment.

At 60 DAT, the longest plant (115.2 cm) was recorded in Muktasail variety with 2/3rd of recommended dose of fertilizer and the lowest (77.00 cm) was found in Kalizira with control treatment. At 75 DAT, Maloti was recorded to have the highest plant height (126.5 cm) with recommended dose of fertilizer while Kalizira had the lowest (85.13 cm) with control treatment. Muktasail possessed the longest plant (124.5 cm) at harvest with recommended dose of fertilizer in soil and Kalizira with control treatment had the shortest plant (91.40 cm) at harvest.

From the above result, it was observed that in most cases, the longest plant was found for applying recommended dose of fertilizer (F_1) in soil and in all cases, the shortest plant was noticed where no fertilizer i.e. control treatment applied. In most of the cases, Maloti had the highest plant height and Kalizira produced the lowest. It was found that application of N-P-K (20:10:10) in lowland rice increases the heights of *NERICA*36 and *NERICA*42 rice varieties compared to the control [4]. *NERICA*36 had a height of 60 cm at a dose of 200 kg while the control had a height of 15 cm, and *NERICA*42 had a height of 83cm at a dose of 180 kg while the control had only 30 cm. [4]. Tallest plant was recorded (112.83 and 116.40 cm) in rice receiving N-200 kg ha^{-1} compared to four lower nitrogen doses [5]. Different literatures show that

plant height increased significantly with the increasing rates of fertilizers [6-11]. The shortest plant height might be due to no use of fertilizers that greatly reduced plant growth and development due to the shortage of nutrients resulting lowest height of plant.

3.2 Number of Tillers

Fertilizer application had a significant effect on the tiller number of all aromatic rice varieties at 15, 30, 45, 60 and 75 DAT and at harvest (Table 4). The highest tillers number hill^{-1} (7.50) at 15 DAT was found in Kalizira and the lowest (6.08) was observed in Chinigura variety. But at 30 DAT, the highest tillers number hill^{-1} (8.42) was recorded in Maloti and the lowest (7.50) was still in Chinigura. The highest tillers number hill^{-1} (10.67) at 45 DAT was also found in Maloti while the lowest (9.42) was found in both Muktasail and Nagrasail varieties. Among five aromatic rice varieties, Kalizira showed the highest tillers number hill^{-1} (12.00 and 18.42) at 60 DAT and 75 DAT. The lowest tillers number hill^{-1} at 60 DAT (10.17) was found in Muktasail and it was also observed in Muktasail (13.33) at 75 DAT. Till up to harvest, Kalizira and Muktasail varieties continued to produce the highest (18.00) and the lowest (13.00) tiller number hill^{-1}.

The effect of different levels of fertilizer on tiller number hill^{-1} of aromatic rice varieties at 15, 30, 45, 60 and 75 DAT and at harvest was found significantly different from one another (Table 5). Recommended dose of all fertilizer (F_1) produced the highest tillers number hill^{-1} (7.60) at 15 DAT and those pots receiving 1/3rd of recommended dose had the lowest (6.20) number. Latter in every case, the highest tillers number hill^{-1} was recorded for recommended dose of fertilizer (F_1), and control treatment had the lowest number. The highest tillers numbers hill^{-1} at 30, 45, 60 and 75 DAT and at harvest were 9.07, 11.20, 13.27, 20.00 and 19.33, respectively and the lowest tillers numbers were 6.67, 8.40, 9.07, 11.13 and 11.00, respectively.

Table 1. Effect of variety on plant height at 15, 30, 45, 60, 75 DAT and at harvest

Variety and fertilizer	Plant height (cm)					
	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	At harvest
Kalizira (V_1)	43.27 b	73.51 bc	80.38 c	91.09 c	104.8 c	102.6 d
Muktasail (V_2)	43.45 b	72.21 c	80.84 bc	108.6 a	116.1 a	116.9 a
Nagrasail (V_3)	42.09 b	74.51 bc	82.53 ab	98.88 b	112.1 b	111.7 b
Maloti (V_4)	47.26 a	80.96 a	84.49 a	100.1 b	112.2 b	110.8 b
Chinigura (V_5)	46.79 a	75.64 b	84.39 a	98.00 b	110.3 b	107.4 c
SE±	0.5776	0.699	0.5332	0.8987	0.8728	0.7122
LS	**	**	**	**	**	**

In a column, the figure(s) having similar letter(s) do not differ significantly
SE± = Standard error, LS = Level of significance,
*** = Highly significant at 1% level*

Table 2. Effect of fertilizer on plant height at 15, 30, 45, 60, 75 DAT and at harvest

Variety and fertilizer	Plant height (cm)					
	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	At harvest
RD (F_1)	50.29 a	80.25 a	87.09 a	108.4 a	121.2 a	120.0 a
2/3rd of RD (F_2)	44.02 c	76.43 b	82.66 b	102.1 b	114.0 b	111.3 b
1/3rd of RD (F_3)	46.28 b	76.06 d	82.22 b	96.63 c	109.5 c	106.7 c
Control (F_4)	37.70 d	68.72 c	78.14 c	90.30 d	99.67 d	101.4 d
SE±	0.5166	0.6252	0.4769	0.8039	0.7806	0.637
LS	**	**	**	**	**	**

In a column, the figure(s) having similar letter(s) do not differ significantly
Recommended Dose (45-10-20-10-0.5 kg ha^{-1} of N-P-K-S-Zn),
SE (±) = Standard error, LS = Level of significance,
*** = Highly significant at 1% level*

Table 3. Effect of variety and fertilizer on plant height at 15, 30, 45, 60, 75 DAT and at harvest

Variety and fertilizer	Plant height (cm)					
	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	At harvest
V_1F_1	49.63 b-d	80.94 b	86.26 bc	107.2 b-d	118.9 bc	113.4 cd
V_1F_2	42.69 e-g	76.63 b-d	79.94 e-h	90.24 gh	108.9 b-f	105.0 f-h
V_1F_3	45.29 d-f	74.09 c-e	79.82 e-h	89.92 gh	106.1 ef	100.7 g-i
V_1F_4	35.20 h	62.39 f	75.52 h	77.00 i	85.13 h	91.40 j
V_2F_1	50.46 bc	77.30 b-d	83.19 c-e	114.2 ab	121.6 ab	124.5 a
V_2F_2	40.13 h	73.00 de	81.60 c-f	115.2 a	118.3 bc	116.4 bc
V_2F_3	50.25 e-g	76.00 b-d	81.48 d-f	103.7 be	116.5 bc	115.4 bc
V_2F_4	32.89 e-g	62.54 f	77.08 f-h	101.5 d-f	107.9 d-f	111.3 c-e
V_3F_1	43.25 c-e	76.78 b-d	83.83 c-e	102.1 d-f	117.7 bc	117.4 bc
V_3F_2	43.56 h	76.21 b-d	82.79 c-e	104.2 de	114.7 b-d	112.9 cd
V_3F_3	46.12 d a	76.42 b-d	82.34 c-e	97.25 e-g	112.3 c-e	108.4 d-f
V_3F_4	35.42 b-e	68.63 e	81.15 d-g	92.00 gh	103.9 f	108.0 d-f
V_4F_1	55.49 a	88.75 a	92.35 a	112.5 a-c	126.5 a	123.8 a
V_4F_2	47.84 b-e	80.07 bc	84.94 cd	103.5 de	119.9 ab	117.0 bc
V_4F_3	45.10 d-g	78.63 b-d	83.83 c-e	96.83 e-g	105.5 ef	105.4 e-g
V_4F_4	40.59 fg	76.38 b-d	76.84 gh	87.67 h	97.00 g	96.86 ij
V_5F_1	52.58 ab	77.46 b-d	89.82 ab	106.0 cd	121.5 ab	121.1 ab
V_5F_2	45.61 c-f	76.25 b-d	84.03 c-e	97.25 e-g	108.0 d-f	105.3 e-g
V_5F_3	44.64 e-g	75.17 b-d	83.61 c-e	95.42 fg	107.2 ef	103.9 f-h
V_5F_4	44.34 e-g	73.67de	80.12 e-g	93.33 gh	104.4 f	99.33 hi
SE±	1.155	1.398	1.066	1.797	1.746	1.424
LS	**	**	**	**	**	**

In a column, the figure(s) having similar letter(s) do not differ significantly
*V_1 = Kalizira, V_2 = Muktasail, V_3 = Nagrasail, V_4 = Maloti, V_5 = Chinigura, F_1 = RD, F_2 = 2/3rd of RD, F_3 = 1/3rd of RD, F_4 = Control, LS = Level of significance, ** = Highly significant at 1% level, SE± = Standard error, Recommended Dose (45-10-20-10-0.5 kg ha^{-1} of N-P-K-S-Zn)*

Table 4. Effect of variety on tiller number at 15, 30, 45, 60, 75 DAT and at harvest

Variety and fertilizer	Number of tiller (nos. hill^{-1})					
	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	At harvest
Kalizira (V_1)	7.50 a	8.25 a	9.92 b	12.00 a	18.42 a	17.99 a
Muktasail (V_2)	7.08 ab	7.58 b	9.42 b	10.17 b	13.33 d	13.00 d
Nagrasail (V_3)	7.00 ab	7.67 b	9.42 b	11.42 a	16.17 b	16.08 b
Maloti (V_4)	6.58 bc	8.42 a	10.67 a	11.50 a	14.83 c	14.33 c
Chinigura (V_5)	6.08 c	7.50 b	9.92 b	10.67 b	13.75 d	13.42 d
SE±	0.1423	0.1288	0.1796	0.1661	0.1703	0.1981
LS	**	**	**	**	**	**

In a column, the figure(s) having similar letter(s) do not differ significantly
*SE± = Standard error, LS = Level of significance, ** = Highly significant at 1% level*

Table 5. Effect of fertilizer on tiller number at 15, 30, 45, 60, 75 DAT and at harvest

Variety and fertilizer	Number of tiller (nos. hill^{-1})					
	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	At harvest
RD (F_1)	7.6 a	9.067 a	11.2 a	13.267 a	20.0 a	19.333 a
2/3rd of RD (F_2)	7.067 b	8.4 b	10.4 b	11.933 b	16.733 b	15.933 b
1/3rd of RD (F_3)	6.2 c	7.4 c	9.467 c	10.333 c	13.333 c	13.533 c
Control (F_4)	6.533 c	6.667 d	8.4 d	9.067 d	11.133 d	11.0 d
SE±	0.1273	0.1152	0.1606	0.1485	0.1523	0.1772
LS	**	**	**	**	**	**

In a column, the figure(s) having similar letter(s) do not differ significantly
*Recommended Dose (45-10-20-10-0.5 kg ha^{-1} of N-P-K-S-Zn), SE± = Standard error, LS = Level of significance, ** = Highly significant at 1% level*

Table 6. Effect of variety and fertilizer on tiller number at 15, 30, 45, 60, 75 DAT and at harvest

Variety and fertilizer	Number of tiller (nos. hill^{-1})					
	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	At harvest
V_1F_1	7.33 b-e	10.00 ab	11.67 bc	14.33 ab	26.67 a	25.00 a
V_1F_2	8.67 a	8.67 cd	9.67 d-h	13.67 b	20.67 b	19.67 bc
V_1F_3	6.33 e-h	7.33 e-g	10.00 d-g	10.67 d-f	13.67 g-i	14.00 hi
V_1F_4	7.67 a-d	7.00 fg	8.33 hi	9.33 f-h	12.67 h-j	13.00 ij
V_2F_1	7.00 c-f	8.33 de	9.67 d-h	11.00 c-e	15.33 ef	15.00 jh
V_2F_2	8.00 a-c	8.33 de	9.67 d-h	10.67 d-f	14.00 f-h	13.33 i
V_2F_3	6.67 d-g	6.67 g	9.33 e-h	9.67 e-h	12.33 ij	12.33 i-k
V_2F_4	6.67 d-g	7.00 fg	9.00 f-h	9.33 f-h	11.67 jk	11.33 kl
V_3F_1	8.33 ab	9.00 b-d	11.00 b-d	13.67 ab	21.00 b	20.33 b
V_3F_2	6.67 d-g	7.33 e-g	9.67 d-h	11.67 cd	16.67 de	16.33 fg
V_3F_3	6.33 e-h	8.00 d-f	10.00 d-g	11.67 cd	16.33 de	16.33 fg
V_3F_4	6.67 d-g	6.33 g	7.00 i	8.67 gh	10.67 k	11.33 kl
V_4F_1	8.33 ab	10.67 a	13.33 a	15.00 a	18.33 c	18.33 cd
V_4F_2	6.00 f-h	9.67 a-c	12.33 ab	11.67 cd	17.67 cd	16.67 ef
V_4F_3	5.67 gh	7.00 fg	8.33 hi	9.67 e-h	11.67 jk	11.67 j-l
V_4F_4	6.33 e-h	6.33 g	8.67 gh	9.67 e-h	11.67 jk	10.67 l
V_5F_1	7.00 c-f	7.33 e-g	10.33 c-f	12.33 c	18.67 c	18.00 de
V_5F_2	6.00 f-h	8.00 d-f	10.67 c-e	12.00 cd	14.67 fg	13.67 hi
V_5F_3	6.00 f-h	8.00 d-f	9.67 d-h	10.00 e-g	12.67 h-j	13.33 i
V_5F_4	6.33 h	6.67 g	9.00 f-h	8.33 h	9.00 l	8.67 m
SE±	0.2846	0.2576	0.3592	0.3322	0.3406	0.3962
LS	**	**	**	**	**	**

In a column, the figure(s) having similar letter(s) do not differ significantly
*V_1 = Kalizira, V_2 = Muktasail, V_3 = Nagrasail, V_4 = Maloti, V_5 = Chinigura, F_1 = RD, F_2 = 2/3rd of RD, F_3 = 1/3rd of RD, F_4 = Control, LS = Level of significance, ** = Highly significant at 1% level, SE± = Standard error, Recommended Dose (45-10-20-10-0.5 kg ha^{-1} of N-P-K-S-Zn)*

The interaction of variety and fertilizer affected significantly on tillers number hill^{-1} at 15, 30, 45, 60 and 75 DAT and at harvest time (Table 6 above). Kalizira produced the highest tillers number hill^{-1} (8.67) at 15 DAT with 2/3rd of recommended dose of fertilizer. The lowest value (6.00) at 15 DAT was observed in three interactions viz. Maloti with 2/3rd, Chinigura with 2/3rd and Chinigura with 1/3rd of recommended doses of fertilizer. At 30 DAT, 45 DAT and 60 DAT Maloti was found to have the highest tillers number hill^{-1} (10.67, 13.33 and 15.00, respectively). The lowest value (6.33) at 30 DAT was recorded in both Nagrasail and Maloti varieties. The lowest tillers number hill^{-1} at 45 DAT was found in Nagrasail (7.00), and at 60 DAT it was found in Chinigura (8.33). At 75 DAT and harvest, Kalizira produced the highest tillers number hill^{-1} (26.67 and 25.00, respectively), and the lowest were observed only in Chinigura (9.0 and 8.67, respectively).

In the above results, it was observed that different varieties show different tillers number hill^{-1} at different DATs. But maximum time, Kalizira or Maloti was found to produce the highest number of tillers and Chinigura or Nagrasail produced the lowest. Except at 15 DAT, all observations indicated the highest value for using recommended dose and the lowest values for using no fertilizer. It was found that application of N-P-K (20:10:10) increase the number of tillers of *NERICA*36 and *NERICA*42 rice varieties compared to the control [4]. Besides, maximum number of tillers hill^{-1} was found (24.4 and 26.7) in hybrid rice receiving N-200 kg ha^{-1} while the rice receiving no nitrogen produced the lowest number of tillers hill^{-1} (10.8 and 11.9) [5]. The growth characters of rice increased significantly with the application of increasing fertilizer doses [12-15]. This experimental result also showed that the number of tillers hill^{-1} was increased with the increasing rates of fertilizer.

4. CONCLUSION

It is concluded from the result that plant height and tiller number at 15, 30, 45, 60, 75 DAT and at harvest were significantly differed among varieties and fertilizer levels as well as by the interaction effect. In most cases, the highest plant height and tiller number were found for applying recommended dose of all fertilizers (F_1)

in soil and in all cases, the lowest plant height and tiller number noticed where no fertilizer i.e. control treatment applied. In case of varietal performance, different varieties show different tiller number hill^{-1} at different DATs. But in maximum time Kalizira or Maloti was found to produce the highest number of tiller and Chinigura or Nagrasail produced the lowest. In order to obtain better growth of aromatic local transplant aman rice, recommended dose of fertilizer (45-10-20-10-0.5 kg ha^{-1} of N-P-K-S-Zn) may be applied under the similar agro-climatic condition in similar soil.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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