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TILLERING DYNAMICS, GRAIN GROWTH AND YIELD PERFORMANCE OF FOUR RICE VARIETIES

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ABSTRACT

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Tiller number is the key determinant of rice plant architecture and panicle number and consequently controls grain yield. In today's crop production systems with high yield outputs, improvement in grain filling has become more challenging than ever before. A field experiment was carried out with four rive varieties *viz.* Binadhan-5, Binadhan-8, Binadhan-10 and Binadhan-14 during Boro season 2020-21 at BINA farm, Mymensingh. For grain growth studies, ten spikelets were harvested from middle of the panicles of three plants of each variety at 3-day interval starting from fertilization to maturity. Results showed that tillering pattern of all the varieties was similar up to 22 DAT. Binadhan-14 produced the higher number of tillers than Binadhan-5. At the end Binadhan-8 had lower number of tillers than other varieties due to its lower number of secondary tillers. Grain dry weight accumulation was the highest in Binadhan-8 followed by Binadhanb-10. Binadhan-5 and Binadhan-8 showed lower grain dry weight accumulation. Grain dry weight was significantly increased up to 24 days thereafter it is not increased significantly. Although all the varieties had some differences in morphological parameters, however the varieties did not show significant differences in grain yield.

Key words: *tillering, grain growth, yield, rice*

INTRODUCTION

Rice is the main food for more than half of the world's population and in today's crop production systems with high yield outputs, improvement in grain filling has become more challenging than ever before. Tiller number is the key determinant of rice plant architecture and panicle number and consequently controls grain yield. Thus, it is necessary to optimize the tiller number to achieve the maximum yield in rice (Zhao *et al*. 2020). Grain filling is the final stage of growth in cereals where fertilized ovaries develop into caryopses. The yield of rice is an integrated result of various processes including canopy photosynthesis, conversion of assimilates to biomass, and partitioning of assimilates to grains (Jeng *et al.* 2006). Grain filling in cereals depends on carbon from two sources: current assimilates transferred directly to the grain and assimilates redistributed from reserve pools in vegetative tissues either pre-or post-anthesis (Schnyder 1993). Under adequate moisture conditions, pre-anthesis assimilate, reserves of rice (*Oryza sativa*) contribute 10–40% of the final grain weight (Schnyder 1993). After fertilization rice grain dry weight increases up to 24 days and rate of assimilation is influenced by environmental stress and grain size (Moonmoon *et al.* 2020; Hafiz *et al.* 2015; Islam 2013; Islam 2010; Islam *et al*. 2005 and Islam 2001). The study was undertaken to compare tillering and grain growth pattern and yield performance of the rice varieties.

MATERIALS AND METHODS

A field experiment was carried out with four rive varieties *viz.* Binadhan-5, Binadhan-8, Binadhan-10 and Binadhan-14 during Boro season 2020-21 at BINA farm, Mymensingh. The experiments were laid out following a randomized complete block design with three replications having a unit plot size of 4 m × 5 m. Row to row and plant to plant distances were 20 cm and 15 cm, respectively. Recommended doses of fertilizers were applied and cultural practices were done whenever required. Ten spikelets were harvested from middle of the panicles of three plants of each treatment at 3-day interval starting from fertilization to maturity. Eight harvests were made from fertilization to maturity at every 3-day intervals. Dry weights of those grains were recorded. Grain weight sample was dried at 80^{o}C for 72 hours. Yield data were harvested when 80% spikelets attained maturity. Total tillers^{-1}, effective tiller hill^{-1} (number), filled and unfilled grains panicle^{-1} (number), 1000-grain weight (g), grain yield and straw yield hill^{-1} (g) were recorded. Data were recorded at harvest from 10 randomly selected plants of each plot and grain yield was taken from the whole plot and converted into ton ha^{-1}.

RESULTS AND DISCUSSION

Results showed that tillering pattern of all the varieties was similar up to 22 DAT (Table 1). Then Binadhan-14 produced the higher number of tillers than Binadhan-5. At the end Binadhan-8 had lower number of tillers than other varieties. That was due to its lower number of secondary tillers (Table 2). Grain dry weight accumulation was the highest in Binadhan-8 followed by Binadhanb-10. Binadhan-5 and Binadhan-8 showed lower grain dry weight accumulation. Grain dry weight was significantly increased up to 24 days thereafter it is not increased significantly (Table 3). Varietal grain growth patterns are shown in Fig. 1-4. All the varieties showed a sigmoid pattern. They showed an initial lag period of 7-8 days, after this a liniar phage of 8-13 days followed by sigmoid phase. The results are in conformity with many authors (Moonmoon *et al.* 2020; Hafiz *et al*. 2015; Islam 2013; Islam 2010; Islam *et al.* 2005 and Islam and Gretzmacher, 2001). Although all the varieties had some differences in morphological parameters, however the varieties did not show significant differences in grain yield.

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Table 1. Tillering dynamics of four rice varieties

Varieties	11-14 (DAT)	15-18 (DAT)	19-22 (DAT)	23-26 (DAT)	27-30 (DAT)	31-34 (DAT)	35-38 (DAT)	39-42 (DAT)	43-46 (DAT)	47-50 (DAT)
Binadhan-5	1.86a	3.06a	3.63b	5.38b	7.03ab	8.63a	9.79ab	11.17a	11.49a	11.53a
Binadhan-8	1.76a	3.11a	4.25ab	5.45ab	6.28b	7.47a	7.97b	8.54b	8.68b	8.68b
Binadhan-10	2.35a	3.79a	4.57ab	5.56ab	7.01ab	7.78a	8.94ab	9.93ab	10.39ab	10.39ab
Binadhan-14	2.49a	3.84a	5.20a	6.31a	7.51a	8.97a	10.46a	11.57a	11.79a	11.79a

In a column, figure(s) with same letter or without letter do not differ significantly at $P \leq 0.05$ by DMRT

Table 2. Primary, secondary and tertiary tillers production of four rice varieties

Varieties	Primary tillerhill^{-1} (no.)	Secondary tillerhill^{-1} (no.)	Tertiary tillerhill^{-1} (no.)
Binadhan-5	2.67a	4.92a	3.94a
Binadhan-8	3.00a	2.34b	3.34a
Binadhan-10	2.67a	4.24ab	3.48a
Binadhan-14	2.67a	4.56a	4.56a

In a column, figure(s) with same letter or without letter do not differ significantly at $P \leq 0.05$ by DMRT

Table 3. Grain dry weight of four rice varieties from fertilization to maturity at 3-day interval

Varieties	Mean grain weight (mg) of 8 harvests
Binadhan-5	14.03c
Binadhan-8	15.03a
Binadhan-10	14.50b
Binadhan-14	13.76c
Days after fertilization	**Mean grain weight over varieties**
0	3.75g
4	5.50f
8	7.24e
12	13.35d
16	17.26c
20	20.45b
24	23.63a
28	23.46a

In a column, figure(s) with same letter or without letter do not differ significantly at $P \leq 0.05$ by DMRT

Table 4. Morphological and yield attributes of four rice varieties

Varieties	Plant height (cm)	Effective tiller hill^{-1} (no.)	Total tiller hill^{-1} (no.)	Filled grain panicle^{-1} (no.)	Unfilled grain panicle^{-1} (no.)	Panicle length (cm)	1000-grain weight (g)	Straw weight (t ha^{-1})	Yield (t ha^{-1})	Harvest index (%)
Binadhan-5	102.60a	10.37ab	11.53a	126.00a	29.35a	25.07b	24.56b	9.91a	5.00a	50.54a
Binadhan-8	101.33a	7.93b	8.68b	130.19a	37.54a	28.47a	25.83a	9.49a	4.97a	52.37a
Binadhan-10	99.87a	9.60ab	10.39ab	124.44ab	34.68a	28.13a	24.80b	9.58a	4.98a	52.08a
Binadhan-14	77.93a	11.03a	11.79a	118.15b	35.39a	23.33b	22.93c	9.54a	4.52a	47.33a

In a column, figure(s) with same letter or without letter do not differ significantly at $P \leq 0.05$ by DMRT

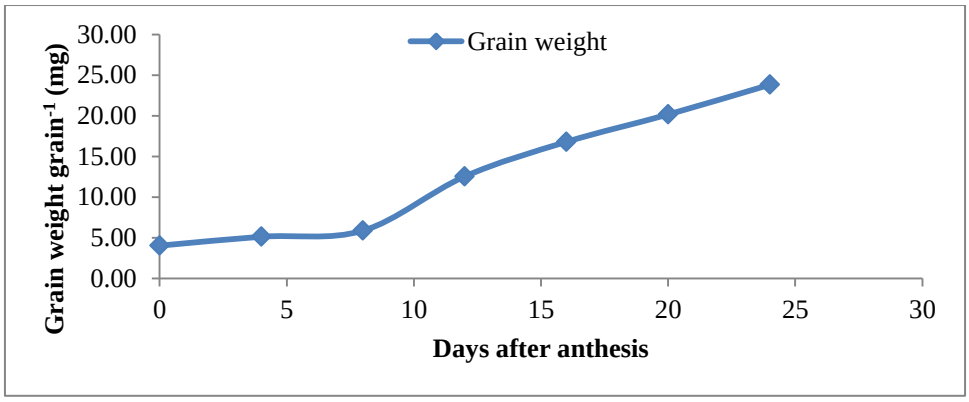

Fig. 1. Grain growth pattern of Binadhan-5

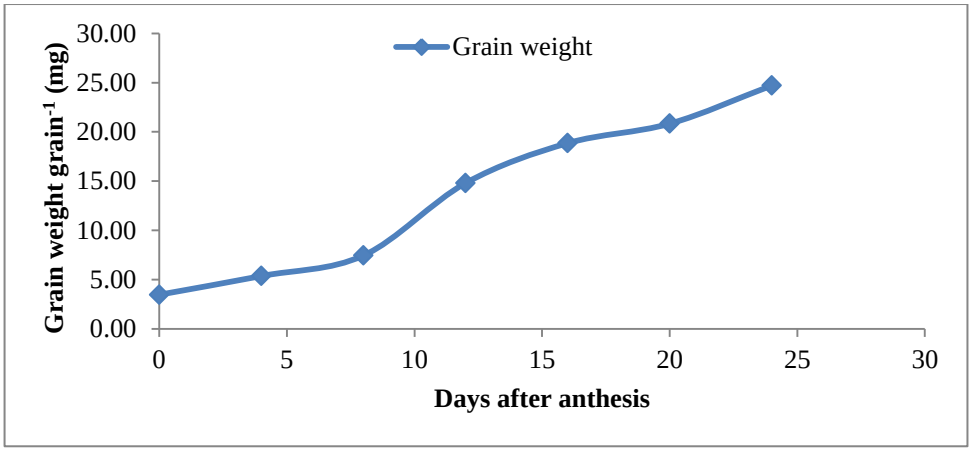

Fig. 2. Grain growth pattern of Binadhan-8

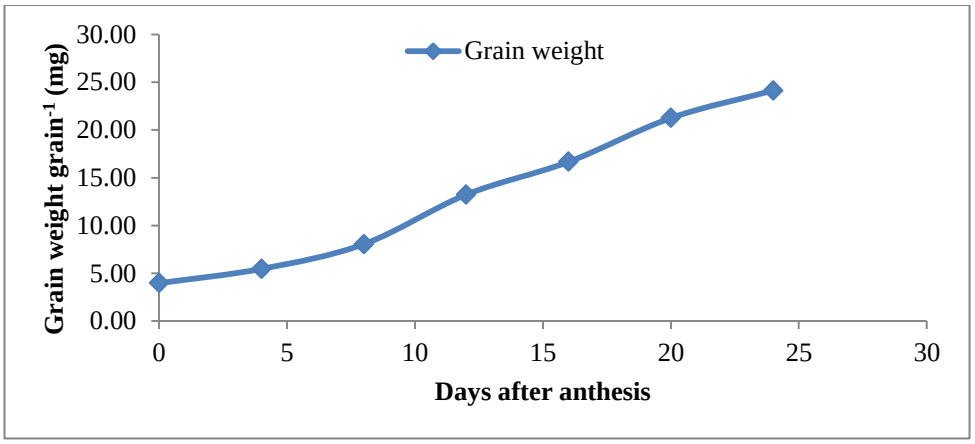

Fig. 3. Grain growth pattern of Binadhan-10

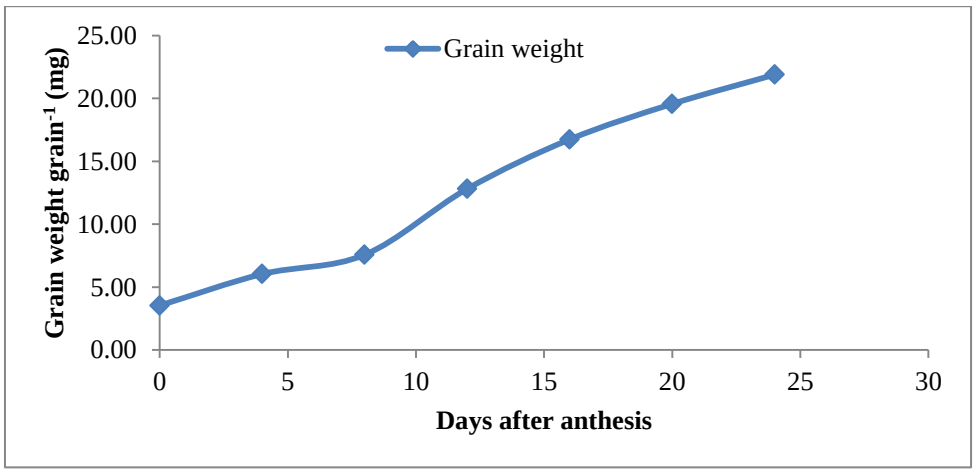

Fig. 4. Grain growth pattern of Binadhan-14

CONCLUSION

Binadhan-5, Binadhan-8, Binadhan-10 and Binadhan-14 had some differences in morphological parameters but did not show significant differences in grain yield.

REFERENCES

Hafiz MA, Islam MT, Karim MA (2015) Grain growth and yield performance of aromatic rice genotypes under different soil moisture regimes. *Int. J. Sustain. Crop Prod*. 10(2), 44-47.

Islam MT (2010) Photosynthesis, conductance, transpiration, water use efficiency and grain growth of high yielding rice varieties under water stress. *Int. J. Expt. Agric*. 1(2), 1-4.

Islam MT (2013) Photosynthesis, chlorophyll stability and grain growth of aromatic rice genotypes under high temperature. *Bangladesh J. Nuclear Agric*. 27&28: 9-14.

Islam MT, Gretzmacher R (2001) Grain growth pattern and yield performance of some transplanted aman rice cultivars in relation to moisture stress. *Bangladesh J. Nuclear Agric*. 16&17: 21-28.

Islam MT, Khan MEH, Islam MT (2005) Grain growth pattern and yield attributes of boro rice genotypes under soil moisture stress. *J. Bangladesh Soc. Agric. Sci. Technol*. 2(3&4), 25-28.

Jeng TL, Tseng TH, Wang CS, Chen CL, Sung JM (2006) Yield and grain uniformity in contrasting rice genotypes suitable for different growth environments. Field Crops Res. 99: 59–66.

Moonmoon S, Fakir MSA, Islam MT (2020) Assimilation of grain on yield and yield attributes of rice (*Oryza sativa* L.) genotypes under drought stress. *Fourrages*. 241(3), 85-98.

Schnyder H (1993) The role of carbohydrate storage and redistribution in the source-sink relations of wheat and barley during grain filling- a review, 1993, New Phytologist. 123: 233-245.

Zhao S, Jang S, Lee YK, Kim DG, Jin Z, Koh HJ (2020) Genetic basis of tiller dynamics of rice revealed by genome-wide association studies. DOI: 10.21203/rs.3.rs-54023/v1