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PERFORMANCE OF BINADHAN-17 WITH BINADHAN-18 AND BRRI DHAN-29 AS AFFECTED BY DIFFERENT PLANTING TIME IN MAGURA DISTRICT OF BANGLADESH

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ABSTRACT

The experiment was carried out during the period of December to May 2019 at the BINA substation Magura farm and farmers' field sottopur, sadar, Magura in a randomized complete block design with three replications. The experiment was conducted to study the effect of planting time on the yield and yield attributes along with three sowing time viz. 15 December, 25 December, 05 January and transplanting was done on 24 Jan.; 03 Feb.; 13 Feb. in the main field along with three varieties viz. Binadhan -17, Binadhan-18, BRRIdhan-29. From on farm trial, it revealed that; The transplanting time of February 03 have found more yield and duration (7.62t/ha and 142 days) and transplanting time of January 24 have found have yield and duration 7.59 t/ha and 147 days which was statistically same; lowest yield found in February 13 that was 6.89t/ha and duration 136 days. From on station trial, it revealed that; the January 24 transplanting date was found more yield and duration (7.28t/ha and 147days) and February 03 was found (6.06t/ha and 142 days); lowest yield was found in February 13 transplanting date that was (4.5t/ha and 136 days). From both results discussion, it concluded that Transplanting at January 24 would be the optimum time along with different planting time of Binadhan-17 in Maguraregion.

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INTRODUCTION

Rice is the most important food crop of the world and the staple food of more than 3 billion people of the world's population. Rice is grown in more than a hundred countries with a total harvested area of about 158 million hectares, producing more than 700 million metric tons paddy every year. Around 67% of Bangladesh's cultivated land area is used and producing 53.6 million tons paddy every year (FAO, 2018). Bangladesh is the fourth largest producer and consumer of rice in the world with an annual production of 34.71 million metric tons (BBS, 2017) of rice after China, India, and Indonesia. Bangladesh ranks first in per capita rice consumption (172kg/year). As 70 percent of caloric requirement and 56 per cent of protein intake comes from rice. Our culture and heritage is deeply rooted in rice. Rice is often considered to be a political and strategic commodity because of its convincing socio-economic, cultural and political importance. Rice alone contributes 46 percent of crop GDP and 5 percent of overall GDP. Bangladesh is now on the verge of attaining self-sufficiency in cereal crop production; there is still a gap between the production and demand. Again, population in the country is increasing rapidly and land under rice cultivation is decreasing day by day due to rapid urbanization and development of infrastructures. If this situation continues we have to face hard challenge to feed the numerous hungry mouths of the future. So, we should think of expanding rice production per unit area and increasing productivity or both. In Bangladesh, three major rice seasons namely Aus, T. Aman and Boro constitute 100% of total rice production and grow in three overlapping seasons. Among three growing seasons, Boro rice (irrigated rice) occupied the second highest, which is about 41.94% of total rice land and contributes 54.57% of the total rice production (Anonymous, 2017). When emergence rate for each sowing date was calculated using a common base temperature they were found to be well correlated with rate of change of day length. Time of sowing determines time of flowering and it has great influence on dry matter accumulation, seed set and seed yield (Sofield, 1977). Sowing at proper time allows sufficient growth and development of a crop to obtain a satisfactory yield because high temperature is one of the major environmental stresses that affect plant growth and development (Boyer, 1982). To increase yield and its stability, it is necessary to take into consideration to determine the optimum sowing date for achieving higher yield of Binadhan-17 in Magura region**.**

MATERIALS AND METHODS

The experiment was laid out in a randomized complete block design with three replications. The land was well prepared and fertilized with recommended rate of fertilizers. i.e. urea, triple super phosphate, muriate of potash , gypsum and zinc sulphate. Sprouted seeds were sown in the seed bed on 15 Dec.; 25 Dec.; 05 Jan. and transplanting was done on 24 Jan.; 03 Feb.; 13 Feb. in the main field. Thus all the treatments got the same intercultural operations i.e. fertilization, weeding, water management, insecticide application were done as and when necessary. Harvesting was done when 90 % of the grains become golden yellow in color. Five hills were randomly selected from each unit plot prior to harvest for recording data. Data on plant height, number of total tillers/hill, number of effective tillers/hill, number of no effective tillers/hill, grains/panicle, sterile spikelets, yield/1m^2/plot were recorded. The recorded and calculated data were analyzed statistically for various characters using computer based program MSTAT-C.

RESULTS AND DISCUSSION

On-farm performance

The study revealed from the Table 1, Significant variation was observed among the varieties viz. Binadhan-17, Binadhan-18, BRRIdhan-29 ; variation found in plant height, panicle length, number of filled spikelets/panicle, number of unfilled spikelets/panicle, sterility, thousand seed weight and grain yield(t/ha). The highest plant height(116.82cm), panicle length(25.91) , thousand seed weight(27.024g) and sterility(52.32%) was found in Binadhan-18 followed by BRRIdhan-29 while the lowest plant height(95.62cm), panicle length(23.31cm) and sterility(23.75%) was found in Binadhan-17. But have no significant variation found in days to 50% flowering, number of total tiller/hill, number of panicles/hill among these varieties that was statistically same. In the on-farm trial with the effect of variety, Binadhan-17 produced highest grain yield which was 7.79t/ha and days to maturity was 142 days although Binadhan-18 produced statistically same grain yield which was 7.45t/ha and maturity period was 138 days followed by BRRIdhan-29 produced lowest grain yield which was 6.8t/ha and maturation completed in 144days.The significant variation was observed due to varying sowing date at 10 days interval (Table 2) ; variation observed in 50% flowering, days to harvest and grain yield but have nonsignificant

variation found in no of total tiller/hill, no of panicles/hill, no of filled and unfilled spikelets/panicle as well as sterility. Results revealed that January 24 and February 03 sowing date required 119.44 days for 50% flowering which was statistically similar; on the other hand February13 sowing date required 99.2 days. Late sown crop flowered earlier than those of early sown crop (Table 2) which might be due to the fact that higher temperature reduced vegetative growth and enhanced flowering (Summer et al .1985, Nihal 2010). Similar trend was observed in 50% flowering as well as crop maturity. Late sown crop matured about 7-10 days earlier than that of early sown crop. This was obvious as high temperatures increase rate of plant development (Entz and Fowler, 1991) and reduced length of the reproductive period (Angadi et al. 2000). The February 03 transplanting time was found have more yield and duration (7.62t/ha and 142 days) and January 24 transplanting time was found have yield and duration 7.59 t/ha and 147 days which was statistically same; lowest yield found in February 13 that was 6.89t/ha and duration 136 days. In terms of interaction effect, varieties Binadhan-17, Binadhan-18 and BRRI dhan29 showed maximum grain yield transplanted at February 03; which was (8.5 t/ha and 144 days), (7.9t/ha and 137 days) and (6.3 t/ha and 144 days) respectively. The results from the Table 2 revealed that average grain yield showed the transplanted at 24 January among this variety. Whereas, the lowest yield and days to maturity was found with Binadhan-18 transplanted at February 13 (6.3 t/ha and 133 days (Table 3).

Table 1. On-farm performance of *Boro*rice Effected by variety

Variety	Days to 50% flowering	Days to harvest	Plant Height (cm)	No. of total tiller/hill	No. of panicles/ hill	Panicle length (cm)	No. of filled spikelets/ panicle	No. of unfilled spikelets/ panicle	Sterility (%)	1000 seed weight (g)	Grain yield (t/ha)
Binadhan-17 (V_1)	112.67 a	142.89b	95.62 c	11.514 a	10.644a	23.311c	138.53 a	49.200 a	35.909 b	23.758 b	7.7967 a
Binadhan-18 (V_2)	113.38 a	138.11c	116.82 a	10.978 a	10.922a	25.918a	76.93 c	38.067 b	52.329 a	27.024 a	7.4578 a
BRRI dhan29 (V_3)	111.67 a	144.89a	104.51 b	11.689 a	10.056a	24.695b	97.16 b	44.289 ab	48.236 ab	22.112 c	6.8611 b
SE	2.4474	0.6976	0.8961	1.2278	0.6296	0.5214	7.5553	4.3342	6.7137	0.1440	0.1725
$LSD_{0.05}$	5.1882	1.4788	1.8996	2.6029	1.3348	1.1054	16.016	9.1881	14.232	0.3053	0.3656
Level of significance	NS	*	*	NS	NS	*	*	*	*	*	*
CV	4.61%	1.04%	1.80%	22.86%	12.67%	4.49%	15.38%	20.97%	31.31%	1.26%	4.96%

Figures bearing same letter (s) in a column do not differ significantly at 5% level of probability by LSD. NS - Non significant.

Table 2. On-farm performance of *Boro*rice with relation to planting time

Planting Time	Days to 50% flowering	Days to harvest	Plant Height (cm)	No. of total tiller/hill	No. of panicles / hill	Panicle length (cm)	No. of filled spikelets/ panicle	No. of unfilled spikelets/ panicle	Sterility (%)	1000 seed weight (g)	Grain yield (t/ha)
Jan 24 (T_1)	119.44 a	147.44 a	104.78 b	11.667 a	11.044 a	25.723 a	113.91 a	42.889 ab	42.191 a	24.326 ab	7.5933 a
Feb 03 (T_2)	119.04 a	142.00 b	107.22 a	11.470 a	10.011 a	24.801 a	110.76 a	50.000 a	46.217 a	24.486 a	7.6267 a
Feb 13 (T_3)	99.22 b	136.44 c	104.95 b	11.044 a	10.567 a	23.400 b	87.96 b	38.667 b	48.065 a	24.083 b	6.8956 b
SE	2.4474	0.6976	0.8961	1.2278	0.6296	0.5214	7.5553	4.3342	6.7137	0.1440	0.1725
$LSD_{0.05}$	5.1882	1.4788	1.8996	2.6029	1.3348	1.1054	16.016	9.1881	14.232	0.3053	0.3656
Level	*	*	*	NS	NS	*	*	*	NS	*	*
CV	4.61%	1.04%	1.80%	22.86%	12.67%	4.49%	15.38%	20.97%	31.31%	1.26%	4.96%

Figures bearing same letter (s) in a column do not differ significantly at 5% level of probability by LSD. NS - Non significant.

Table3. Interaction effect of variety and planting time on yield and yield contributing characters of Boro rice

Planting Time	Days to 50% flowering	Days to harvest	Plant Height (cm)	No. of total tiller/hill	No. of panicles / hill	Panicle length (cm)	No. of filled spikelets/ panicle	No. of unfilled spikelets / panicle	Sterility (%)	1000 seed weight (g)	Grain yield (t/ha)
Binadhan-17 × Jan 24	117.33 abc	147.00 b	97.53 ef	13.467a	12.067 a	24.083 cd	142.67a	41.733bc	29.518c	24.007b	7.4400 cd
Binadhan-17 × Feb 03	113.33 cd	144.33 c	93.87 g	9.677a	9.200 b	23.850 de	143.27a	61.533a	43.655 abc	24.057b	8.5967a
Binadhan-17 × Feb 13	107.33 de	137.33 d	95.47 fg	11.400a	10.667 ab	22.000 e	129.67a	44.333bc	34.554 bc	23.210c	7.3533 cd
Binadhan-18 × Jan 24	115.00 bcd	144.00 c	116.40 b	9.867a	9.867 ab	27.267 a	68.73cd	39.200bc	60.902a	26.927a	8.1400 ab
Binadhan-18 × Feb 03	120.80 abc	137.33 d	121.53 a	11.733a	11.633 a	26.067 ab	90.40bc	37.533bc	42.052 abc	27.110a	7.9000 bc
Binadhan-18 × Feb 13	104.33 e	133.00 e	112.52 c	11.333a	11.267 ab	24.420 bcd	71.67 bcd	37.467bc	54.032 abc	27.037a	6.3333f
BRRI dhan29 × Jan 24	126.00 a	151.33 a	100.40 e	11.667a	11.200 ab	25.819 abc	130.33a	47.733 abc	36.155 bc	22.043d	7.2000d
BRRI dhan29 × Feb 03	123.00 ab	144.33 c	106.27 d	13.000a	9.200 b	24.487 bcd	98.60b	50.933ab	52.944 abc	22.290d	6.3833ef
BRRI dhan29 × Feb 13	86.00 f	139.00 d	106.87 d	10.400a	9.767 ab	23.780 de	62.53d	34.200c	55.610 ab	22.003d	7.0000 de
SE	4.2390	1.2083	1.5521	2.1266	1.0906	0.9031	13.086	7.5071	11.628	0.2494	0.2987
$LSD_{0.05}$	8.9862	2.5614	3.2902	4.5083	2.3119	1.9146	27.741	15.914	24.651	0.5288	0.6332
Level of significance	*	*	*	NS	*	*	*	*	*	*	*
CV	4.61%	1.04%	1.80%	22.86%	12.67%	4.49%	15.38%	20.97%	31.31%	1.26%	4.96%

Figures bearing same letter (s) in a column do not differ significantly at 5% level of probability by LSD. NS- Non significant.

Table 4. On-station performance of *Boro*rice Effected by variety

Variety	Days to 50% flowering	Days to harvest	Plant Height (cm)	No. of total tiller/hill	No. of panicles / hill	Panicle length (cm)	No. of filled spikelets/ panicle	No. of unfilled spikelets / panicle	Sterility (%)	1000 seed weight (g)	Grain yield (t/ha)
Binadhan-17 (V_1)	116.78 a	144.00 a	88.47 b	8.789 a	8.444 a	22.54 b	117.00 a	33.80 a	28.56 a	22.84 b	5.611 b
Binadhan-18 (V_2)	110.00 b	137.44 b	101.22 a	8.956 a	8.744 a	25.22 a	78.89 b	35.56 a	47.38 a	25.82 a	6.073 a
BRRI dhan29 (V_3)	111.11 b	145.00 a	97.63 a	10.58 a	10.17 a	24.95 a	118.69 a	44.91 a	37.70 a	21.94 b	6.206 a
SE	0.6077	1.2870	1.1957	0.5866	0.5382	0.4617	7.0939	4.4253	5.8768	0.4357	0.1073
$LSD_{0.05}$	2.231	4.726	4.390	2.154	1.977	1.695	26.05	16.25	21.58	1.600	0.3947
Level of significance	*	*	*	NS	NS	*	*	NS	NS	*	*
CV	1.14%	1.92%	2.65%	13.18%	12.52%	4.04%	14.35%	24.65%	32.91%	3.93%	3.82%

Figures bearing same letter (s) in a column do not differ significantly at 5% level of probability by LSD. NS - Non significant.

Table 5. On-station performance of *Boro*rice with relation to planting time

Planting Time	Days to 50% flowering	Days to harvest	Plant Height (cm)	No. of total tiller/hill	No. of panicles/ hill	Panicle length (cm)	No. of filled spikelets/ panicle	No. of unfilled spikelets / panicle	Sterility (%)	1000 seed weight (g)	Grain yield (t/ha)
Jan 24 (T_1)	119.11 a	147.33 a	97.54a	9.978 a	9.643 a	24.42 a	115.51 a	42.98 a	38.86 a	23.62 a	7.281 a
Feb 03 (T_2)	117.05 a	142.78 a	96.27a	9.289 a	8.978 a	24.06 a	90.98 a	30.49 a	34.68 a	23.58 a	6.068 b
Feb 13 (T_3)	99.67 b	136.33 b	93.51a	9.056 a	8.733 a	24.23 a	108.09 a	40.80 a	40.10 a	23.40 a	4.541 c
SE	0.6077	1.2870	1.1957	0.5866	0.5382	0.4617	7.0939	4.4253	5.8768	0.4357	0.1073
$LSD_{0.05}$	2.231	4.726	4.390	2.154	1.977	1.695	26.05	16.25	21.58	1.600	0.3947
Level of significance	*	*	NS	NS	NS	NS	NS	NS	NS	NS	*
CV	1.14%	1.92%	2.65%	13.18%	12.52%	4.04%	14.35%	24.65%	32.91%	3.93%	3.82%

Figures bearing same letter (s) in a column do not differ significantly at 5% level of probability by LSD. NS- Non Significant.

Table 6. Interaction effect of variety and planting time on yield and yield contributing characters of Boro rice

Planting Time	Days to 50% flowering	Days to harvest	Plant Height (cm)	No. of total tiller/hill	No. of panicles/ hill	Panicle length (cm)	No. of filled spikelets/ panicle	No. of unfilled spikelets / panicle	Sterility (%)	1000 seed weight (g)	Grain yield (t/ha)
Binadhan-17 × Jan 24	117.33 c	148.33 ab	90.27 cd	8.533 b	8.267 b	22.07 c	139.73 a	45.40 abc	32.69 abc	23.23 b	7.290 a
Binadhan-17 × Feb 03	123.00 ab	145.00 ab	87.80 d	9.200 b	8.867 b	23.13 bc	99.53 de	27.33 d	27.46 bc	22.90 bc	5.910 c
Binadhan-17 × Feb 13	110.00 e	138.67 c	87.33 d	8.633 b	8.200 b	22.42 bc	111.73 bcd	28.67 d	25.54 c	22.38 bc	3.633 f
Binadhan-18 × Jan 24	115.00 d	144.00 b	104.20 a	9.733 ab	9.533 ab	25.60 a	76.40 ef	35.73 bcd	47.68 ab	25.52 a	7.137 a
Binadhan-18 × Feb 03	112.00 e	136.00 cd	101.40 a	8.667 b	8.433 b	25.06 a	73.33 f	32.80 bcd	44.94 abc	26.26 a	6.360 b
Binadhan-18 × Feb 13	103.00 f	132.33 d	98.87 a	8.467 b	8.267 b	24.99 a	86.93 def	38.13 bcd	49.52 a	25.68 a	4.723 e
BRRI dhan29 × Jan 24	125.00 a	149.67 a	99.95 a	11.67 a	11.13 a	25.60 a	130.40 ab	47.80 ab	36.21 abc	22.12 bc	7.417 a
BRRI dhan29 × Feb 03	122.33 b	147.33 ab	98.60 ab	10.00 ab	9.633 ab	23.98 ab	100.07 cde	31.33 cd	31.64 abc	21.58 c	5.933 c
BRRI dhan29 × Feb 13	86.00 g	138.00 c	94.33 bc	10.07 ab	9.733 ab	25.27 a	125.60 abc	55.60 a	45.24 abc	22.13 bc	5.267 d
SE	1.0526	2.2292	2.0710	1.0160	0.9323	0.7996	12.287	7.6648	10.179	0.7547	0.1859
$LSD_{0.05}$	2.2315	4.7256	4.390	2.154	1.977	1.695	26.05	16.25	21.58	1.600	0.3947
Level of significance	*	*	*	*	*	*	*	*	*	*	*
CV	1.14%	1.92%	2.65%	13.18%	12.52%	4.04%	14.35%	24.65%	32.91%	3.93%	3.82%

Figures bearing same letter (s) in a column do not differ significantly at 5% level of probability by LSD. NS- Non Significant.

On-Station performance

It was revealed from the Table 4 that, Significant variation was observed among the varieties viz. Binadhan-17, Binadhan-18, BRRI dhan29 ; variation found in plant height, panicle length, no of filled spikelets/panicle, days to 50% flowering, days to harvest, thousand seed weight and grain yield. The highest plant height(101.22cm), panicle length(25.22) , thousand seed weight(25.82g) was found in Binadhan-18 followed by BRRIdhan-29 while the lowest plant

height(95.62cm), panicle length(23.31cm) was found in Binadhan-17. But have no significant variation found in no. of total tiller/hill, no. of panicles/hill, no of unfilled spikelets, sterility among these varieties that was statistically same. In the on-station trial with the effect of variety, Binadhan-18 and BRRI dhan29 produced statistically same and highest grain yield which was 6.07 t/ha and 6.21 t/ha respectively. Binadhan-18 took the lowest days to mature (137.44). Whereas, Binadhan-17 (144.00) and BRRI dhan29 took more days to mature; this was statistically same.

The significant variation was observed due to varying sowing date at 10 days interval (Table 5) ;variation observed in 50% flowering,days to harvest and grain yield but have non-significant variation found in plant height,no. of total tiller/hill,no. of panicles/hill,no. of filled and unfilled spikelets/panicle,thousand seed weight as well as sterility. Results revealed that January 24 and February 03 sowing date required 119.44 days for 50% flowering which was statistically similar; on the other hand February13 sowing date required 99.2 days. Late sown crop flowered earlier than those of early sown crop (Table 2) which might be due to the fact that higher temperature reduced vegetative growth and enhanced flowering (Summer et al., 1985, Nihal 2010). Similar trend was observed in 50% flowering as well as crop maturity. Late sown crop matured about 7-10 days earlier than that of early sown crop. This was obvious as high temperatures increase rate of plant development (Entz and Fowler, 1991) and reduced length of the reproductive period (Angadi et al., 2000). The January 24 transplanting time was found have more yield and duration (7.28 t/ha and 147.33 days) than February 13 (4.54 t/ha and 136.33 days). In terms of interaction effect, varieties Binadhan-17, Binadhan-18 and BRRI dhan29 showed maximum grain yield transplanted at January 24; which was 7.29 t/ha, 7.14 t/ha and 7.42 t/ha respectively. Whereas the lowest yield and days to maturity was found with Binadhan-18 transplanted at February 13 (4.72 t/ha and 132.22 days).

CONCLUSION

From the result it can be said that January 24 would be the optimum Transplanting date for better grain yield and Binadhan-17 showed maximum grain yield and days to maturity was (7.4 t/ha and 147 days) whereas have no lodging tendency by strong storm and heavy rainfall as well as poor infestation of diseases and insects followed by February 03 and February 13 transplanting date. Although at that time Binadhan-18 showed average grain yield and days to maturity was (7.6 t/ha and 144 days) but there have tendency to lodging due to strong storm and heavy rainfall as well as susceptible to diseases and insect infestation compared to Binadhan-17(7.4t/ha and 147days) and BRRIdhan 29(7.3 t/ha and 149 days).

Competing interest: To develop new technology for horticultural species in Bangladesh.

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