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PERFORMANCE OF RAPESEED AND MUSTARD WITH DIFFERENT PLANTING TECHNIQUES

P.K. Biswas[1*], L.J. Ferdous[2], T.S. Roy[1] and S.M. Masum[3]

[1] Professor, Dept. of Agronomy, Sher-e-Bangla Agricultural University
[2] MS Student, Dept. of Agronomy, Sher-e-Bangla Agricultural University
[3] Assoc. Professor, Dept. of Agronomy, Sher-e-Bangla Agricultural University
[*]Corresponding E-mail: parimalbiswas@hotmail.com

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Abstract

The experiment was conducted at Sher-e-Bangla Agricultural University farm to evaluate the performance of five rapeseed and mustard varieties under two different planting techniques. The planting techniques were as conventional sowing and sowing seeds in puddle soil that assigned to the main plot and five varieties viz. Improved Tori-7, BARI Sarisha -13, BARI Sarisha -15, BARI Sarisha -16 and SAU SR-3 in the sub-plots. Almost all the studied parameters were found statistically similar under two planting techniques except siliqua length that was higher (5.51 cm) in conventional method compared to that of sowing in puddled soil (5.14 cm). The highest number of siliquae plant^{-1} (143.67) was obtained from BARI Sarisha -16 that was similar to SAU SR-03 (134.15) and Improved Tori-7 (116.90). The maximum1000-seed weight (4.35 g) was obtained from BARI Sarisha -16 under conventional planting method that was similar to BARI Sarisha -13 irrespective of planting methods. The maximum number of siliqua plant^{-1} (145.20) was found in BARI Sarisha -16 under conventional planting method that was similar to the same variety in puddle soil (142.13), SAU SR-03 in both the planting method and Improved Tori-7 in conventional method (131.20). The Improved Tori-7 variety gave the maximum seed yield (2.24 t ha^{-1}) followed by BARI Sarisha -16 (1.96 t ha^{-1}). The highest seed yield was given by the variety BARI Sarisha -16 in conventional planting method (2.39 t ha^{-1}) that was similar to Improved Tori-7 variety irrespective of planting techniques.

Introduction

Rapeseed & Mustard (*Brassica* spp. L.) commonly known as mustard in Bangladesh, is a cool season, thermo sensitive as well as photosensitive crop (Ghosh and Chatterjee, 1988). Rapeseed and mustard is the major oilseed crop of Bangladesh both on the basis of its total cultivated area and production, respectively. The present yield of rapeseed-mustard (0.95 tha^{-1}) is very low as compared to other oilseeds growing countries in the world. The main reasons of lower yield are lack of good quality seed and inadequate adoption of improved production technologies developed by different research institutes (Miah *et al.*, 2014). Presently, on an average, 2.3 to 2.4 million tonnes of edible oils, both in oil and seeds form, are imported in the country (Alam, 2018). The internal production of edible oil can meet up only less than one-third of the annual requirement (Mondal and Wahhab, 2001). There is a great scope of increasing yield of mustard by selecting high yielding varieties and improving management practices (Bhuiyan *et al.*, 2008). Time of sowing is very important for rapeseed/ mustard production (Rahman *et al.,* 1988; Mondal and Islam, 1993 and Mondal *et al.*, 1999). Sowing at proper time allows sufficient growth and development of

a crop to obtain a satisfactory yield which can be fitted in between *Aman* and *Boro* rice. Farmers mostly grow the traditional variety of Tori-7 for its shorter duration (70-80 days) but average yield only 750 kg ha^{-1}. This variety is advantageous to grow as catch crop between *Aman* and *Boro* rice with minimum input and tillage practices.

There is ample scope of replacing the traditional farmers varieties by the short duration yellow seeded variety, having yield capacity of 1.50-1.65 tha^{-1} and can easily be grown in the Aman-Mustard - Boro cropping system with 2-3% increased oil content for yellow seed without hampering existing Boro rice cultivation. In such situation, sowing time of rapeseed and mustard should be done by late October to early November that is frequently affected by rainfall and make challenge of better productivity of the pattern. Therefore, the proposed study was undertaken to find out the suitability of alternate planting method of rapeseed and mustard to fit it in the promising and widely used cropping pattern *Aman*-Mustard-*Boro* of Bangladesh.

Materials and Methods

The experiment was conducted at the Agronomy field of Sher-e-Bangla Agricultural University, Dhaka during the period from November 2013 to June 2014. The seeds of five rapeseed and mustard varieties namely Improved Tori-7, BARI Sarisha-13, BARI Sarisha-15, BARI Sarisha-16 and SAU SR-3 were collected from Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur and Sher-e-Bangla Agricultural University (SAU). The land was finally leveled with leveler to ensure uniform application of water. The unit plot size was 4m x 3m.The plot was fertilized with @ 250-170-85-150-5-15 kg ha^{-1} of urea, TSP, MoP, Gypsum, Zinc sulphate and boric acid, respectively. The whole amount of all fertilizers except urea was applied as a basal dose during final land preparation. The urea fertilizer was applied as two equal installments; as basal dose and before flowering. The treatment of puddle condition of respective plots were maintained by applying water & finally leveled. The equal amount of seeds of all varieties were sown on November 5, 2013. The spacing was maintained as 30 cm in continuous soild line.

The experiment was laid out in a split-plot design with three replications. Two planting techniques namely conventional (P_1) and Puddle soil (P_2) were assigned in the main plot and five varieties viz., Improved Tori-7 (V_1), BARI Sarisha-13 (V_2), BARI Sarisha-15 (V_3), BARI Sarisha-16 (V_4) and SAU SR-3 (V_5) in the sub-plot. Water was ensured to the field in such a way that there should not have any scarcity of water that affects the experiment. Two hand weedings were done for all the treatments at 15 and 25 days after sowing (DAS). The field was infested by different insects and diseases which were controlled as and when necessary. The different varieties were harvested on different dates at full maturity. The harvested plants were threshed & the seeds were dried to a constant moisture level. Statistical analyses were done by using the Crop Stat computer package and the mean differences among the treatments were compared by least significant difference test at 5 % level of significance following Gomez and Gomez (1984).

Results and Discussion

Siliqua length

Effect of planting technique

The siliqua length was significantly differed due to planting technique (Table 1) where longer siliqua (5.51 cm) was found in conventional sowing compared to that of sowing in puddle soil (5.14 cm).

Effect of variety

The variety showed significant effect on siliqua length (Table 1). The maximum length (7.19 cm) was recorded in BARI Sarisha-13 followed by BARI Sarisha-15 (5.24 cm), Improved Tori-7 (4.94 cm) and SAU SR-3 (4.83 cm) whereas the minimum siliqua length was found in BARI Sarisha-16 (4.42 cm) that was similar to SAU SR-3 and Improved Tori-7.This result was in conformity to the finding of Akhter (2005) who pointed out that variations in siliqua length among the varieties were statistically significant. Hossain *et al.* (1996) also reported that the varieties differed significantly in respect of siliqua length. It has been also reported that the napus group showed higher siliqua length than that of juncea group (BARI, 2001).

Interaction effect of planting technique and variety

The maximum siliqua (7.41 cm) was obtained from conventional planting technique with the variety BARI Sarisha-13 (P_1V_2), which was statistically similar with the same variety sown in puddle soil (P_2V_2), and the smallest siliqua (4.29 cm) from BARI Sarisha-16 in puddle soil (P_2V_4) which was statistically similar with P_1V_4 (4.55 cm), P_1V_5 (4.85 cm), P_2V_3 (4.91 cm) and P_2V_5 (4.82 cm) (Fig. 1).

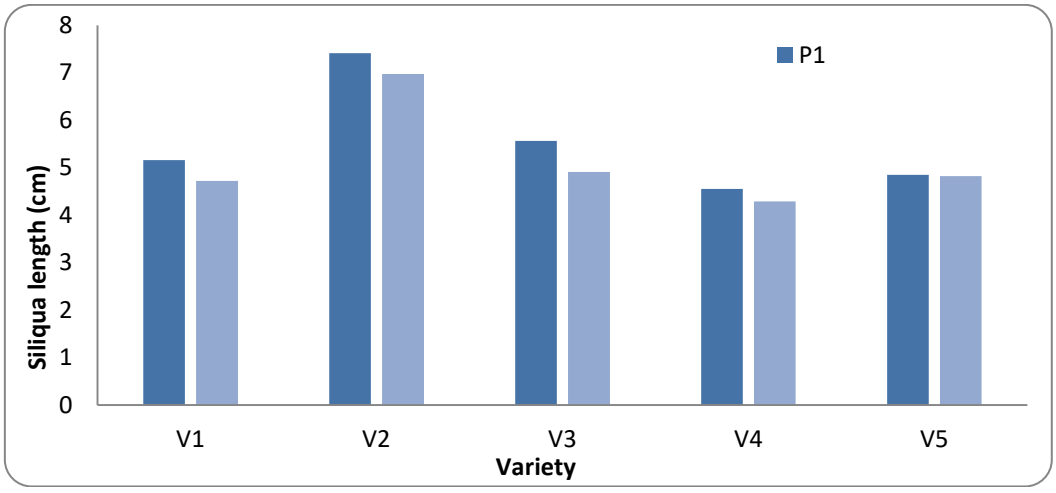

Fig. 1. Interaction effect of planting technique and variety on siliqua length of rapeseed and mustard

P_1 = Conventional technique, P_2 = Puddle soil, V_1 = Improved Tori-7, V_2 = BARI Sarisha-13, V_3 = BARI Sarisha-15, V_4 = BARI Sarisha-16, V_5 = SAU SR-3

Number of siliqua plant^{-1}

Effect of planting technique

There was no significant variation of siliquae number plant^{-1} observed between the two planting technique though the numerically higher number of siliquaeplant^{-1} (118.11) was found in the conventional planting method and lower number of siliquaeplant^{-1} (109.53) was obtained from the puddle soil condition (Table 1).

Effect of variety

The highest number of siliqua plant^{-1} (143.67) was observed in V_4 which was statistically similar with V_5 (134.15) and V_1 (116.90) while the lowest number of siliqua (83.95) was obtained from V_3 which was statistically similar with V_2 (90.43). Akhter (2005), Roy (2008) and Mamun *et al.* (2014) agreed with the result of this finding that the number of siliqua plant^{-1} of rapeseed mustard was significantly affected by the varieties.

Interaction effect of planting technique and variety

The maximum number of siliqua plant^{-1} (145.20) was obtained from conventional planting technique of the variety BARI Sarisha-16 (P_1V_4), which was statistically similar with the same variety sown in puddle soil (P_2V_4), P_1V_5 (138.67), P_1V_1 (131.20) and P_2V_5 (129.63). The lowest number of siliqua plant^{-1} (80.43) was obtained from BARI Sarisha-15 in puddle soil (P_2V_3) which was statistically similar with P_1V_2 (88.00), P_1V_3 (87.47), P_2V_2 (92.87) and P_2V_1 (102.60) (Fig. 2).

Number of seeds siliqua^{-1}

Effect of planting technique

There was no significant variation of number of seeds siliqua^{-1} observed between the two planting technique though the numerically higher number of seeds siliqua^{-1} (18.34) was found in the puddle soil condition and lower number of siliquae siliqua^{-1} (17.99) was obtained from the conventional planting method (Table 1).

Table1. Effect of planting technique and variety on siliqua length, no. of siliqua plant^{-1}and no. of seeds siliqua^{-1} of rapeseed and mustard

Treatments	Siliqua length (cm)	Number of siliqua plant^{-1}	Number of seeds siliqua^{-1}
Planting technique:			
P_1	5.51	118.11	17.99
P_2	5.14	109.53	18.34
$LSD_{(0.05)}$	0.142	NS	NS
CV (%)	1.70	20.80	9.56
Variety:			
V_1	4.94	116.90	15.55
V_2	7.19	90.43	21.32
V_3	5.24	83.95	22.34
V_4	4.42	143.67	12.95
V_5	4.83	134.15	18.67
$LSD_{(0.05)}$	0.529	28.432	2.993
CV (%)	8.13	20.41	13.46

P_1 = Conventional technique, P_2 = Puddle soil, V_1 = Improved Tori-7, V_2 = BARI Sarisha-13, V_3 = BARI Sarisha-15, V_4 = BARI Sarisha-16, V_5 = SAU SR-3

Effect of variety

The highest number of seeds siliqua^{-1} (22.34) was observed in BARI Sarisha-15 (Table 1) which was statistically similar with BARI Sarisha-13 (21.32) and the lowest number of seeds siliqua^{-1}(12.95) from BARI Sarisha-16 which was statistically similar with Improved Tori-7 variety(15.55).Variation in seeds siliqua^{-1} among the varieties was in conformity with Mamun *et al.* (2014), who found the highest seeds siliqua^{-1} in BARI Sarisha-13 and the lowest seeds siliqua-1 in BARI Sarisha-16 This result supports the findings of Jahan and Zakaria (1997) and Gurjar and Chauhan (1997). Variation in seeds siliqua^{-1} among the varieties was also in conformity with Islam *et al.* (1994) who found a significant variation in number of seeds siliqua^{-1} among different varieties of mustard and rapeseed.

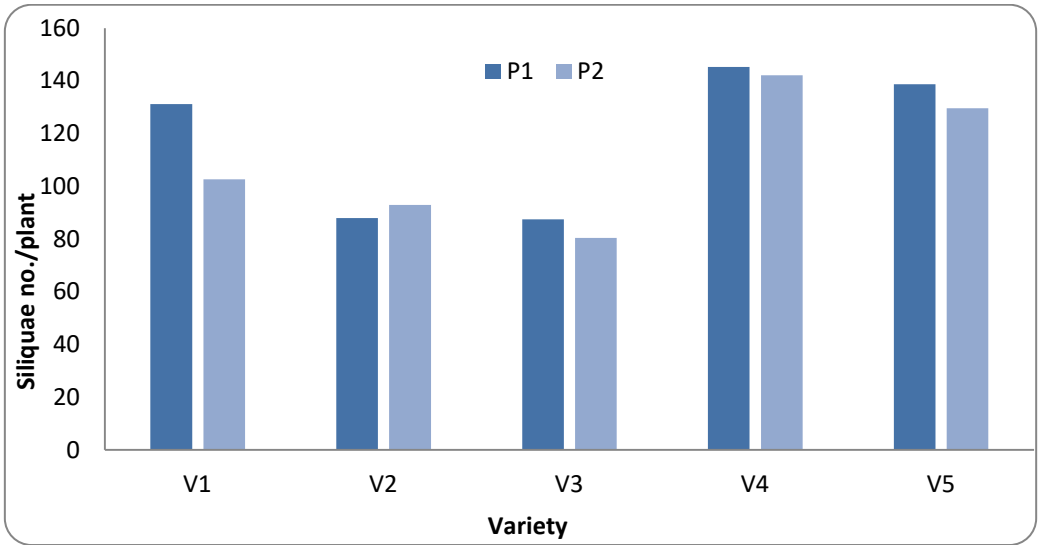

Fig. 2. Interaction effect of planting technique and variety on siliqua number/plant of rapeseed and mustard

P_1 = Conventional technique, P_2 = Puddle soil, V_1 = Improved Tori-7, V_2 = BARI Sarisha-13, V_3 = BARI Sarisha-15, V_4 = BARI Sarisha-16, V_5 = SAU SR-3

Interaction effect of planting technique and variety

The maximum number of seeds siliqua^{-1} (23.32) was obtained from conventional planting technique of the variety BARI Sarisha-15 (P_1V_3), which was statistically similar (22.75) with BARI Sarisha-13sown in puddle soil (P_2V_2), P_2V_3 (21.37), P_1V_2 (19.88) and P_2V_5 (19.40). The lowest number of seeds siliqua^{-1}(12.30) was obtained from BARI Sarisha-16 in puddle soil (P_2V_4) which was statistically similar with P_1V_4 (13.60), P_2V_1 (15.91) and P_1V_1 (15.20) (Fig. 3).

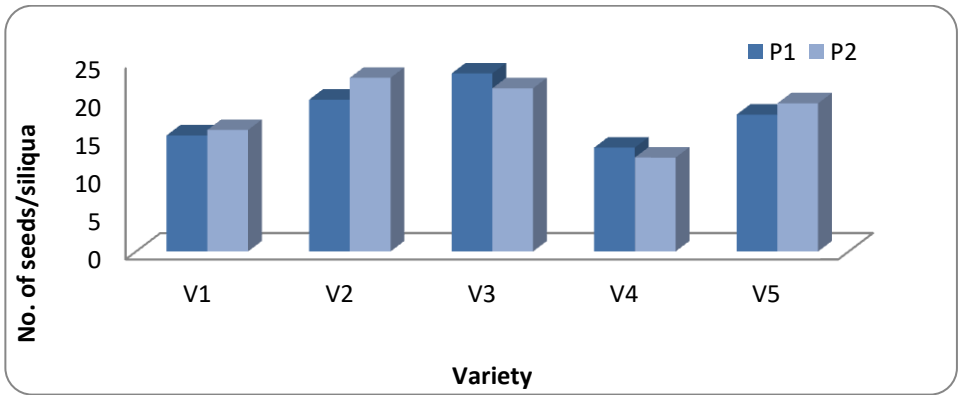

Figure 3. Interaction effect of planting technique and variety on number of seeds/ siliquaof rapeseed and mustard

P_1 = Conventional technique, P_2 = Puddle soil, V_1 = Improved Tori-7, V_2 = BARI Sarisha-13,
V_3 = BARI Sarisha-15, V_4 = BARI Sarisha-16, V_5 = SAU SR-3

Weight of 1000 - seeds

Effect of planting technique

There was no significant variation of 1000-seed weight observed between the two planting technique though numerically higher weight (3.79 g) was found in the conventional planting method and lower weight (3.45 g) from the puddle soil

condition (Table 2). This result was in conformity with the findings of Hossain *et al.* (2013) who reported that 1000- seed weight did not show any significant variation due to sowing method (Table 2).

Effect of variety

The maximum weight of 1000-seeds (4.07 g) was observed in BARI Sarisha-13 followed by BARI Sarisha-16 (Table 2) which was followed by SAU SR-3 (3.69 g) and Improved Tori-7 (3.07 g) and the lowest 1000-seed weight (3.21 g) from BARI Sarisha-15. Mamun *et al.* (2014) also observed that BARI Sarisha-13 had the highest 1000- seed weight (4.00 g) whereas the lowest (2.82 g) - in SAU Sarisha-3.

Table 2. Effect of planting technique and variety on 1000-seed weight and seed yield of rapeseed and mustard

Treatments	Weight of 1000 seeds (g)	Seed yield (t ha^{-1})
Planting technique:		
P_1	3.79	1.89
P_2	3.45	1.56
$LSD_{(0.05)}$	NS	NS
CV (%)	8.15	13.88
Variety:		
V_1	3.07	2.24
V_2	4.07	1.57
V_3	3.21	1.34
V_4	4.07	1.96
V_5	3.69	1.53
$LSD_{(0.05)}$	0.297	0.195
CV (%)	6.70	9.24

P_1 = Conventional technique, P_2 = Puddle soil, V_1 = Improved Tori-7, V_2 = BARI Sarisha-13,
V_3 = BARI Sarisha-15, V_4 = BARI Sarisha-16, V_5 = SAU SR-3

Interaction effect of planting technique and variety

The maximum 1000-seed weight (4.35 g) was obtained from conventional planting technique of the variety BARI Sarisha-16 (P_1V_4), which was statistically similar (4.09 g) with BARI Sarisha-13 sown in conventional method (P_1V_2) and puddle soil condition, P_2V_2 (4.05 g). The lowest1000-seed weight (2.87 g) was obtained from Improved Tori-7 in puddle soil (P_2V_1) which was statistically similar with P_2V_3 (3.04 g) (Fig. 4).

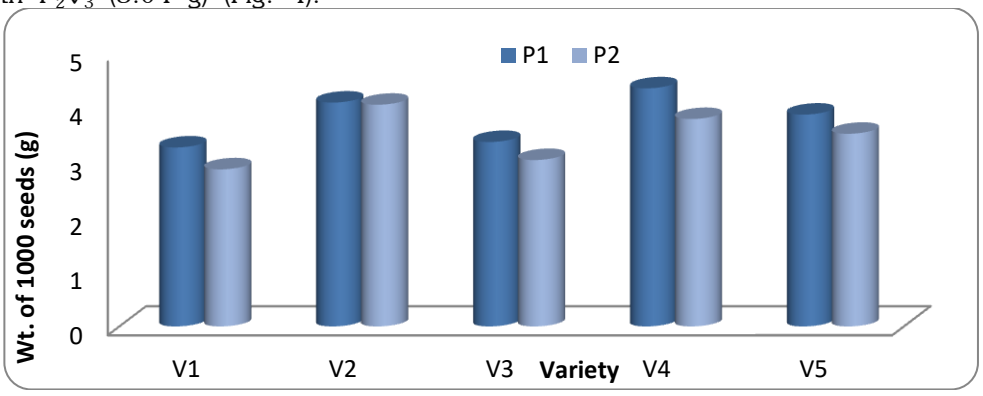

Fig. 4. Interaction effect of planting technique and variety on 1000-seed weight of rapeseed and mustard
P_1 = Conventional technique, P_2 = Puddle soil, V_1 = Improved Tori-7, V_2 = BARI Sarisha-13,
V_3 = BARI Sarisha-15, V_4 = BARI Sarisha-16, V_5 = SAU SR-3

Seed yield

Effect of planting technique

There was no significant variation of seed yield observed between the two planting technique though the numerically higher seed yield (1.89 tha^{-1}) was found in the conventional planting method and the lower seed yield (1.56 t ha^{-1}) from the puddle soil condition (Table 2). This result was at par with the findings of Sarkees (2013) who did not show any variation of mustard seed yield due to planting techniques.

Effect of variety

Higher seed yield (2.24 t ha^{-1}) was observed in Improved Tori-7 variety (Table 2) which was followed by BARI Sarisha-16 (1.96 t ha^{-1}) and BARI Sarisha-13 (1.57 t ha^{-1}). The lowest seed yield (1.34 t ha^{-1}) was obtained from V_3 (BARI Sarisha-15) which was statistically similar with SAU SR-3 (1.53 t ha^{-1}). The result agreed with Rahman (2002), BARI (2001), Zaman *et al.* (1991) and Mendham *et al.* (1981) who reported that seed yield of rape and mustard were varied with different varieties.

Interaction effect of planting technique and variety

The highest seed yield (2.39 t ha^{-1}) was obtained from conventional planting technique of the variety BARI Sarisha-16 (P_1V_4), which was statistically similar with the variety Improved Tori-7 sown in puddle soil (P_2V_1) and same variety in conventional planting method of P_1V_1 (2.11 t ha^{-1}). The lowest seed yield (1.11 t ha^{-1}) was obtained from BARI Sarisha-15 in puddle soil (P_2V_3) which was statistically similar with P_2V_5 (1.38 t ha^{-1}) (Fig. 5).

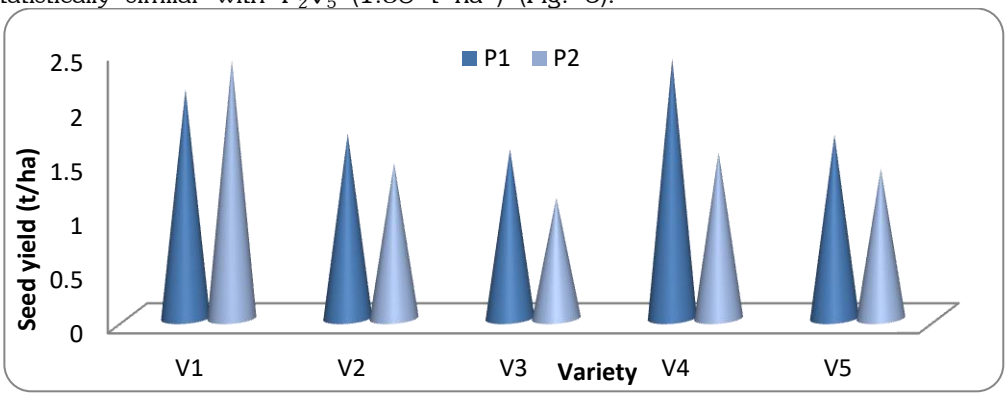

Figure 5. Interaction effect of planting technique and variety on seed yield of rapeseed and mustard
P_1 = Conventional technique, P_2 = Puddle soil, V_1 = Improved Tori-7, V_2 = BARI Sarisha-13,
V_3 = BARI Sarisha-15, V_4 = BARI Sarisha-16, V_5 = SAU SR-3

Conclusion

The planting method did not show any significant variations in all the studied parameters except siliqua length. Variety showed significant influence on all the studied parameters. The highest seed yield (2.39 t/ha) was obtained from conventional planting technique of the variety BARI Sarisha-16 and the lowest seed yield (1.11 t/ha) was obtained from BARI Sarisha-15 in puddle soil. Based on the results of the study, it could be concluded that rapeseed and mustard can be cultivated in puddle soil without any yield loss. Mustard var. BARI Sarisha-16 in conventional method and Improved Tori – 7 in both conventional and puddle soil condition showed higher yield performance compared to that of other varieties.

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