

EFFET OF PLANT SPACING AND DEPTH OF USG PLACEMENT ON YIELD OF BORO RICE

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The farmers have to produce maximum rice from minimum land by adopting improved agronomic practices. Spacing of transplanting and depth of placement of urea super granules (USG) can play a significant role in increasing yield of rice. The plant to plant and row to row distances determine the plant population per unit area. Plant spacing has a direct effect on the yield of rice. The tillering habit and production of spikelets and panicles plant⁻¹ depends on the spacing of transplanting which is responsible for variation in yield of rice. The plant spacing influences the availability of sunlight, leaf area index (LAI), nutrient to the plant and also photosynthesis and respiration.

Nitrogen is an essential element which influences the vegetative growth, seed development, yield and quality of rice. The loss of nitrogen is a problem for rice cultivation in this country. Modified urea fertilizers like USG, sylph coated urea etc. are designed to control one or more types of nitrogen loss to which ordinary urea is commonly susceptible. The superiority of USG, a slow releasing nitrogenous fertilizer, over conventional form of urea providing a steady supply of available nitrogen throughout the growing period of the crop. It may be important to know the optimum depth of placement of urea super granules on the growth, development and yield of Boro rice. An increase in the yield of Boro rice can be expected if appropriate combination of spacing and depth of placement of urea super granules is used. The present study was, therefore, undertaken with the objectives to study the response of spacing of transplanting and depth of placement of urea super granules (USG) on the yield of Boro rice.

The experiment was conducted at the Agronomy Research Field, Bangladesh Agricultural University (BAU), Mymensingh in the Boro season during 2008-2009. It belongs to the non-calcareous dark grey flood plain soil under the agro-ecological region of the Old Brahmaputra Floodplain. The experimental field was medium high with moderate drained condition. The land was silty loam in texture having a soil pH 6.42, and moderate in organic matter content. The experiment was laid out in a two factor randomized complete block design (RCBD) with three replications. The experiment comprised of two spacing of transplanting viz; 20 cm x 20 cm and 20 cm x 25 cm and three depths of placement of urea super granules viz; 6cm, 8cm and 10cm. The sprouted seeds of BRRI dhan29 were sown in the nursery bed on 02 December 2008. Phosphorus @ 120 kg ha⁻¹ as triple super phosphate, potassium @ 60 kg ha⁻¹ as muriate of potash, sulphur @ 40 kg ha⁻¹ as gypsum and zinc @ 10 kg ha⁻¹ as zinc sulphate were applied as a blanket dose in all the plots. A 2.7 g urea super granule was applied at depths of 6 cm, 8 cm and 10 cm at the centre of four hills of two adjacent rows at 10 days after transplanting (DAT). Thirty five days old seedlings were transplanted on the well puddled experimental plots on 06 January 2009. The collected data were compiled and tabulated for statistical analysis and means were adjudged by Duncans Multiple Range Test (Gomez and Gomez, 1984).

Number of effective tillers hill⁻¹, number of grains panicle⁻¹, grain yield and straw yield of Boro rice was significantly influenced by spacing of transplanting (Table 1). The higher number of effective tillers hill⁻¹ (13.37) was obtained from 20 cm x 25 cm spacing than (12.87) 20 cm x 20 cm. The result revealed that 20 cm x 25 cm spacing of transplanting had the greatest opportunity to produce more number of effective tillers hill⁻¹. It might be due to the fact that wider spacing of transplanting provided enough nutrients, light and air which played vital role in producing more effective tillers hill⁻¹. The results are in agreement with the findings of Haque (2002). The higher number of grains panicle⁻¹ (115.84) was obtained from 20 cm x

25 cm spacing of transplanting than from 20 cm x 20 cm spacing of transplanting (114.74). This result was in agreement with that of Sarker *et al.* (2002). Depth of placement of urea super granules showed a significant response on all the yield and yield contributing characters except panicle length and weight of thousand grains (Table 2). The highest number of effective tillers hill⁻¹ (16.39) was obtained from 8 cm depth of placement of USG and the lowest number (11.39) from 10 cm which followed by 6 cm. The highest number of grains panicle⁻¹ (126.77) was found in 8 cm depth of placement of USG and the lowest (107.94) in 6 cm. Continuous availability of nitrogen at 8 cm depth of placement of USG might enhance grain formation and development which eventually resulted in increased number of grains panicle⁻¹. The highest grain yield (5.08 t ha⁻¹) was found in 8 cm depth of placement of USG and the lowest one (3.73 t ha⁻¹) in 6 cm depth. Eight centimeter depth of placement of USG produced the highest number of effective tillers hill⁻¹ and number of grains panicle⁻¹ and ultimately gave the highest grain yield. The highest straw yield (6.18 t ha⁻¹) was obtained from 8 cm depth of placement of USG and the lowest (5.33 t ha⁻¹) from 6 cm depth. Similar trend was followed in harvest index.

Table 1. Response of plant spacing on different crop characters, yield components and yield of Boro rice

Spacing of transplanting	Plant height (cm)	No. of effective tillers hill ⁻¹	Panicle length (cm)	No. of grains panicle ⁻¹	Weight of 1000-grains (g)	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	Harvest index (%)
S ₁	96.45	12.87	21.92	114.74	21.75	4.46	5.70	43.63
S ₂	98.06	13.37	21.67	115.84	21.21	4.24	5.58	43.01
S(\bar{x})	0.42	0.18	0.20	0.61	0.12	0.04	0.04	0.28
CV(%)	4.41	7.23	4.14	3.57	10.01	5.77	7.47	4.53

Table 2. Response of depth of placement of urea super granules on different crop characters, yield components and yield of Boro rice

Depth of USG 4 hills ⁻¹	Plant height (cm)	No. of effective tillers hill ⁻¹	Panicle length (cm)	No. of grains panicle ⁻¹	Weight of 1000 grains (g)	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	Harvest index (%)
D ₁	94.56c	11.49b	21.43	107.94c	21.54	3.73c	5.33b	41.01
D ₂	101.04a	16.39a	21.98	126.77a	21.25	5.08a	6.18a	45.13
D ₃	96.17b	11.39b	21.98	111.15b	21.66	4.23b	5.41b	43.82
S(\bar{x})	0.52	0.22	0.25	0.75	0.14	0.04	0.05	0.34
CV(%)	4.41	7.23	4.14	1.68	10.01	3.57	7.47	4.53

The effect of interaction of spacing of transplanting and depth of placement of urea super granules showed significant variation in respect of plant height, number of effective tillers hill⁻¹, number of grains panicle⁻¹ and grain yield except panicle length, weight of thousand grains and straw yield (Table 3). The highest number of effective tillers hill⁻¹ (16.80) was obtained from 20 cm x 25 cm spacing of transplanting x 8 cm depth of placement of USG and the lowest one (10.39) from 20 cm x 25 cm spacing of transplanting of 6 cm depth. Similar trend was followed in case of no. of grains panicle⁻¹.

From Table 3, it is evident that the highest grain yield (5.30 t ha⁻¹) was obtained from 20 cm x 20 cm spacing of transplanting x 8 cm depth of placement of USG, while the lowest one (3.68 t ha⁻¹) from 20 cm x 20 cm. It is evident that the highest straw yield (5.82) was found in the interaction of 20 cm x 25 cm spacing of transplanting and 2.7 g USG (68 kg N ha⁻¹) and the lowest (5.16 t ha⁻¹) 20 cm x 25 cm spacing of transplanting x 1.8 g USG (46 kg N ha⁻¹).

Table 3. Response of interaction of spacing of transplanting and depth of urea super granules placement on different crop characters, yield components and yield of Boro rice

Interaction (S x D)	Plant height (cm)	No. of effective tillers hill ⁻¹	Panicle length (cm)	No. of grains panicle ⁻¹	Weight of 1000 grains (g)	Grain yield (t ha ⁻¹)	Straw yield (t ha ⁻¹)	Harvest index (%)
S ₁ ×D ₁	92.30c	12.59b	21.23	105.82c	21.61	3.68e	5.32	40.67
S ₁ ×D ₂	100.45a	15.97a	22.10	127.04a	21.59	5.30a	6.32	45.60
S ₁ ×D ₃	96.59b	10.05c	22.43	111.36b	22.06	4.40c	5.45	44.63
S ₂ ×D ₁	96.82b	10.39c	21.63	110.07b	21.47	3.79e	5.34	41.36
S ₂ ×D ₂	101.63a	16.80a	21.86	126.50a	20.91	4.86b	6.04	44.67
S ₂ ×D ₃	95.74b	12.92b	21.53	110.95b	21.25	4.06d	5.36	43.01
S \bar{X}	0.73	0.32	0.35	1.06	0.20	0.06	0.07	0.48
CV (%)	4.41	5.14	4.14	3.57	10.01	5.77	7.47	4.53

S₁ = 20 cm x 20 cm, S₂ = 20 cm x 25 cm

D₁ = 6 cm, D₂ = 8 cm, D₃ = 10 cm

In a column, figures with same letters or without letters do not differ significantly whereas figures with dissimilar letter differ significantly as per DMRT.

Based on the results of the study it can be concluded that the spacing of transplanting of 20 cm x 20 cm in combination with 8 cm depth of placement of USG is the best for obtaining higher yield of Boro rice under the agro-ecological conditions of present study.

References

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