

**INFLUENCE OF SEED PRIMING ON THE GERMINATION AND YIELD  
OF MAIZE AT FARMERS FIELD CONDITION**

K. U. AHAMMAD<sup>1</sup>, S. MONDAL<sup>2</sup>, M. R. ISLAM<sup>3</sup>  
T. ZAHAN<sup>4</sup> AND S. ISHTIAQUE<sup>5</sup>

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Maize (*Zea mays* L.) is one of the most important food grains of the world. In Bangladesh, maize ranks third in respect of total acreage after rice and wheat but ranks first in respect of average yield which are 5.47 t ha<sup>-1</sup> (BBS, 2016). Seed priming is a process in which seeds are imbibed in water or osmotic solutions followed by drying before radical emergence. Harris *et al.* (1999) promoted a low cost, low risk technology called 'on-farm seed priming' that would be appropriate for all farmers. On-farm seed priming involves soaking the seed in water, surface drying and sowing at the same day. Seed priming has been reported as to improve germination, reduce seedling germination time and improve stand establishment, increase emergence, earlier flowering, earlier maturing and higher grain yield. Seed priming can be accomplished through different methods such as hydropriming, osmopriming and solid matrix priming (Harris *et al.*, 1999). The success of seed priming is influenced by the complex interaction of factors including plant species, water potentiality of the priming agent, duration of priming, temperature, seed vigor and storage conditions of the primed seed. In Bangladesh maize can be produced successfully at low moisture content of soil after harvesting transplant *aman* rice by priming of seeds. However, the priming techniques of this crop is not well established in Bangladesh. Although a good number of research works have been done on seed priming of maize in abroad but research works in Bangladesh is scanty. Therefore, the present trial was undertaken to know the performance of seed priming on the yield of maize and associated characters.

The experiment was carried out in the farmers' field at MLT site of Bangladesh Agricultural Research Institute, Jhikargacha, Jessore during *rabi* season 2013-14 and 2014-15. The soils of the experimental plots are sandy loam with low organic matter and pH (7.45) under Agro Ecological Zone-11. The maize variety was 'BARI Hybrid maize-9'. The experiment includes three priming methods *viz.*, T<sub>1</sub>= Hydropriming, T<sub>2</sub>= Osmopriming (3% ZnSO<sub>4</sub> solutions) and T<sub>3</sub>= Non priming (dry seed). The experiment was laid out in a randomized complete block design with four replications. Maize seeds were taken in plastic bowls and

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<sup>1</sup>Principal Scientific Officer, RARS, Bangladesh Agricultural Research Institute (BARI), Jessore, <sup>2</sup>Scientific Officer, RARS, BARI, Jessore, <sup>3</sup>Chief Scientific Officer, OFRD, BARI, Gazipur, <sup>4&5</sup>Scientific Officer, OFRD, BARI, Gazipur, Bangladesh.

submerged with distilled water / osmotic solution of 3% ZnSO<sub>4</sub> for 18 hours. After 18 hours of treatment the seeds were taken out from the bowl and washed under tap water for several times. Then it was surface dried for two hours under shade condition. Seeds were sown on 28 November 2013 and 25 November 2014 maintaining the spacing of 60 cm × 20 cm. The moisture content of the soil of experimental plot was 20% at the time of sowing in both the years. Individual plot size was 5m × 3m. Fertilizers were applied at the rate of 253, 52, 110, 42, 5 and 1 kg N, P, K, S, Zn and B ha<sup>-1</sup>, respectively in the form of urea, triple super phosphate, muriate of potash, gypsum, zinc sulphate and boric acid (BARI, 2010). One-third of urea and all other fertilizers were applied as basal during final land preparation. The rest amount of urea was applied in two splits at 30 DAS (Days after sowing) and 50 DAS. Two hand weeding were done at 20 DAS and 40 DAS. Earthing-up was done at 50 DAS after second irrigation. Four irrigations were applied at 30, 50, 75 and 100 DAS. The crop was harvested on 07 April 2014 and 05 April 2015. Harvested cobs were husked and sun dried. Then cobs were shelled by electric power driven corn sheller followed by cleaning and winnowing. Data on different parameters were recorded following the procedures as below-

**Germination percentage:** The seedlings were counted daily until complete emergence. Germination was calculated in percentage using the following formula:

$$\% \text{ Germination} = \frac{\text{Number of seeds germinated}}{\text{Number of seeds sown}} \times 100$$

**Germination index:** The germination index (GI) was calculated by following formula (AOSA, 1983):

$$GI = \frac{\text{Number of germinated seeds}}{\text{Days of first count}} + \frac{\text{Number of germinated seeds}}{\text{Days of final count}}$$

Mean germination time: The mean germination time (days) was calculated according to the following formula (Scott *et al.*, 1984):

$$\text{MGT (days)} = \frac{\sum T_i N_i}{S}$$

Where, T<sub>i</sub> = Number of days after beginning of experiment

N<sub>i</sub> = Number of seed germinated on day i

S = Total number of seed germinated

After shelling the cobs, it was well dried in the sun for 24 hours and adjusted at 13% moisture content of grain and stover. Data were subjected to statistical

analysis using ANOVA technique through computer based statistical package programme MSTATC.

Germination of maize seeds varied significantly due to priming (Table 1). Germination of maize was the highest (85%) with hydroprimed seeds and the lowest (76%) from non-primed seeds (Table 1). This might be due to positive effect of seed priming. Nagar *et al.* (2011) also stated that hydropriming increased percent and speed of maize seedling emergence. Similar result was also found in maize by Murungu *et al.* (2004). Germination index of maize seeds varied significantly due to seed priming. Germination index showed similar trend as in germination of seeds (Table 1). Seed priming improves emergence at low moisture content of soil. Similar result was also found in maize by Harris *et al.* (2001). Mean germination time of maize seeds varied significantly due to seed priming. Mean germination time was the lowest (5.73 day) with hydroprimed seeds while the highest (6.98 day) for non primed seeds (Table 1). Afzal *et al.* (2009) reported that faster germination is occurred in primed seed due to the earlier synthesis of DNA, RNA and protein. Dry matter plant<sup>-1</sup> varied significantly due to seed priming at 30 DAS (Days after sowing). DM (Dry matter) plant<sup>-1</sup> was highest (0.79 g) with hydroprimed seeds followed by osmoprimed seeds (0.77 g), while the lowest (0.57 g) for non primed seeds (Table 1). Seed priming induces a faster biochemical changes such as hydrolysis, activation of enzymes and dormancy breaking (Farooq *et al.*, 2010) resulted in improvement of maize dry matter and grain yield. DM plant<sup>-1</sup> of maize showed significant variation due to seed priming at 110 DAS. DM plant<sup>-1</sup> was the highest (203.89 g) with hydroprimed seeds and the lowest (149.19 g) for non primed seeds. Dry matter of maize seedling improved with seed priming in the experiment. Similar result was reported by Zaidi *et al* (2004).

Cob length, cob diameter, 100 grain weight, grain yield and straw yield showed significant difference due to priming of seeds. The maximum cob length (19.38 cm), cob diameter (4.49 cm), 100-grain weight (33.43 g) and stover yield (10.74 t ha<sup>-1</sup>) were obtained from hydroprimed seeds and the lowest from non-primed seeds. The highest grain yield (9.85 t ha<sup>-1</sup>) was obtained from hydroprimed seeds due to higher yield attributes but the lowest (8.29 t ha<sup>-1</sup>) from non-primed seeds. It might be due to more activity of enzymes involved in sucrose metabolism in primed seed that extended vigorous crop growth and eventually contributed to higher 100-grain weight and as well as yield. This result is at par with the findings of Harris *et al.* (2007). Hydro-priming of maize seeds exhibited significantly better performance as compared to osmopriming and no priming (i.e. dry seeds) under farmers' field condition. The highest emergence and the lowest mean germination time of maize seeds were found in hydroprimed seeds at low moisture content of soil (20%). Yield and yield contributing characters were also the highest with hydroprimed seeds. So, hydropriming could be used as a

technique to ensure seedling establishment and to improve yield of maize at low moisture content of soil.

**Table 1. Characters of maize as influenced by seed priming at multi-location testing (MLT) site, Jhikargacha, Jessore (Pooled average of 2013-14 and 2014-15)**

Priming	Germination percentage	Germination index	Mean germination time (day)	Dry matter plant <sup>-1</sup> (g)	
				30 DAS	110 DAS
Hydro-priming	85 a	15.28 a	5.73 c	0.79 a	203.89 a
Osmo-priming	81 b	14.42 b	5.81 b	0.77 a	194.68 b
No priming	76 c	11.09 c	6.98 a	0.57 b	149.19 c
CV%	1.46	1.34	1.55	5.22	2.33
Priming	Cob length (cm)	Cob diameter (cm)	100 grain wt. (g)	Grain yield (t ha <sup>-1</sup> )	Stover yield (t ha <sup>-1</sup> )
Hydropriming	19.38 a	4.49 a	33.43 a	9.85 a	10.74 a
Osmopriming	18.33 b	4.39 ab	32.03 b	9.17 b	10.33 b
Non priming	17.18 c	4.20 c	29.60 c	8.29 c	9.63 c
CV (%)	2.51	0.89	1.60	1.87	1.20

Figures with dissimilar letter(s) differ significantly at 0.05 level of probability by DMRT

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