Bangladesh J. Sci. Ind. Res. **42**(3), 361-365, 2007 **Short Communication**

Suitability of Different Cultivars of Wheat and Maize for Cultivation in Coastal Area of Noakhali

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Abstract

The experiment was conducted to screen the salt tolerant variety of maize and wheat at Atkapalia , Noakhali. The result shows that variety Gourav and Kanchan of wheat and Barnali and BARI Bhutta 5 of maize have better adaptability in saline areas of Noakhali. All the crops showed lower yield under salinity. The decrease in yield is attributed to the accumulation of sodium and chloride ions and a decrease in potassium ions. This conclusion is arrived at in the light of previous experimental results on the accumulation of sodium, chlorine and potassium ions in wheat and maize.

Key words :

Introduction

More than 30 % of the net cultivable land in Bangladesh is in the coastal area (Karim *et al*, 1990). Some of these costal areas like Noakhali, Khulna, Potuakhali and Chittagong are seriously affected by various degrees of salinity (Karim *et al.*,1990). A country like Bangladesh, which is thickly populated with limited cultivable land is thus threatened by salinity. As a vast coastal area is gradually becoming uncultivable, efforts are needed to bring back the saline area under cultivation by selecting salt tolerant crops from amongst the existing practices as also by introducing new genotypes/varieties. An experimental set up to evaluate the crop varieties of maize and wheat suitable for coastal areas and the results obtained are reported.

Materials and Methods

The experiment was conducted in Atkapalia, Noakhali at FSR site BARI. Atkapalia Farming System Research site (FSR) is located in Noakhali district in southern-western part of the country and belong to Agro-ecological Zone (AEZ) 18f. Soil salinity test was carried out throughout the growing period (December to March) at a regular intervals of 15 days. Soil samples were

collected at different depth such as 0 - 10 cm, 10 - 20 cm, and 20 - 30 cm deep. Four genotypes of wheat namely Gourav, Kanchan, Protiva and Sourav, and four cultivars of maize namely Barnali, BARI Bhutta 5, Khoibhutta and Pacific11 , were grown in the coastal saline areas, to screen the suitable variety of maize and wheat. Seeds were collected from Wheat Research Centre and Breeding Division of BARI, Joydebpur, Gazipur.

To avoid the possible effect of variation in the soil condition the experiment was carried out using Randomized Complete Block Design (RCBD) with three replications. Crops were sown on 15th December 1999 and also 2000. Recommended fertilizer doses appropriate for wheat and maize were applied. The unit plot size was 4m x 3m for wheat and it was 5m x 4.5 m for maize. Intercultural operation was followed as and when necessary. Yield and yield contributing data were recorded. Ten plants were randomly selected from each plot and tagged for recording height and other yield contributing characteristics. Yield data were recorded for whole plot basis and then converted to kg/ha. Yield and yield contributing characters were taken at harvest. Data were collected and statistically analyzed (DMRT method).

Results and Discussion

Soil salinity and crop growth

During the crop growth period, the soil salinity level at Atkapalia, Noakhali varied from 1.99 to 15.94 dS^{m} Salinity was low in all the experimental plots during the time of sowing with values of salinity 3.6, 3.4 and 3.0 dS^{-m} at depths 0-10 cm, 10-20 cm and 20-30 cm respectively (Table I).

The salinity however increased afterwards from 3.6 dS^{-m} to 5.88 dS^{-m} in the region 0-10 cm deep, from 3.4 dS^{-m} to 3.49 dS^{-m} in the region 10-20 cm deep and 3.00 dS-m to 3.49 dS^{-m} in the region 20-30 cm deep (Table I) in the month of January and maximum 15.94 dSm on mid February. This salinity increase was determined from the conductivity measurement which increases with increasing salinity because the conduction process is

Table I. Soil salinity at different depth of soil at the experimental field of Atkapalkia, Noakhali

Date of samplings	Salinity level (dS^{-m}) at different depth of soil		
	0-10 cm	10-20 cm	20-30 cm
03-01-2000	5.85	3.49	3.49
18-01-2000	6.69	6.82	1.99
02-02-2000	6.82	6.82	5.55
17-02-2000	15.94	6.06	3.36
03-03-2000	10.37	6.69	2.96

carried out by the ions. Salinity increased with the time and reached peak at mid February at soil surface (0-10cm). It was observed that salinity was higher at flowering stage and so the yield might have been affected by the increased salinity of the soil.

Yield performance of different varieties of maize and wheat cultivars in saline area of Atkapalia, Noakhali

All the crops shows lower yield than national average value. Among the different varieties of wheat, the observed difference in yield was significant. Variety Gaurav showed better performance than the other varieties. Gaurav gave significantly highest yield. Plant height was not sighificantly varied among the varieties. Maximum straw yield was observed in gaurav. Thousand grain yield was also highest in Gaurav. These results reflect that Gaurav has maximum yield. Grain yield of Gaurav was 1058 kg/ha which in case of both Sourav and Provati was 608 kg/ha. Plant height and yield attributed characteristics were not significantly influenced by the varieties tested (Table II).

Among the maize varieties grain yields were significantly varied. Length of cob and weights as taken for 1000 grains were significantly different (Table III). In case of maize Barnali showed highest plant height (170.13cm.) and pacific showed lowest height which was 155 cm. Among the varieties, considering plant height, no of cob/plant no of grain/cob, BARI Bhutta 5 and Barnali are least affected and Pacific 11 most affected in saline areas of Noakhali. 1000 grain wt is significantl higher in BARI Bhutta 5 and minimum in Khoibhutta The highest grain yield was observed in BARI Bhutta 5 (962.95kg/ha) which closely followed by Barnali. Pacific-11 showed minimum grain yield which was only 755 Kg/ha. The maximum yield in case of BARI Bhutta 5 might he due to highest no. of cob/plant, no. of grain / cob and also due to higher 1000 grain wt.

Table II. Yield Performance of different wheat cultivars grown in saline area, Atkapali, Noakhali.

Variety	Plant height (cm)	Ear height (cm)	No.of Spiklet / spike	No.of grain / spike	No.of tiller/ plant	1000 grain wt.(g)	Straw yield (kg/ha)	Grain yield (kg/ha)
Gourav	77.4	7.4	17.3	34.8	5.93	4.2 a	2.33	1058 a
Kanchan	77.3	6.8	19.0	35.9	6.70	4.1a	1.77	775 b
Sourav	76.0	6.7	19.7	35.8	6.70	3.5c	1.87	608 c
Protiva	79.1	6.9	18.87	36.3	5.60	3.8 b	1.73	608 c
	NS	NS	NS	NS	NS		NS	

Table III. Yield performance of different maize cultivars grown in saline area, Atkapolia, Noakhali

Variety	Plant height (cm)	No. of cob/plan	Cob length (cm)	No.of grain/ cob	1000 grain weight (g)	Grain Yield (kg/ha)
Barnali	170.13	1.60	10.40	362.00	18.73b	933.32a
Khoibhutta	163.20	1.53	11.67	353.30	14.28c	888.88b
BARI Bhutta 5	161.30	1.60	10.83	364.50	21.63a	962.95a
Pacific 11	155.00	1.40	10.50	345.00	17.60b	755.35c
	NS	NS	NS	NS		

The hybrid maize Pacific 11 gave minimum yield and showed maximum susceptibility to salinity (Table III).

From the experimental result, it concluded that variety Gourav and Kanchan of wheat could be cultivated in saline area of Noakhali with reasonable yield. Maize varieties BARI Bhutta 5 and Barnali showed better adaptability in saline areas of Noakhali.

Salinity caused an increase in accumulation of Na^+ and $C1^-$ and a decrease in accumulation of K^+. It was reported that Na : K ratio in plants is positively correlated with salinity and negatively correlated with yield (Ahmad *et al.* 1989). From the previous work, it was found that salinity increases Na^+ and $C1^-$ ions in maize, and also in wheat but decreases K^+ ions in these crops (Begum and Karmoker, 1997; Begum *et. al.* 2000). So, the decrease in yield in maize and wheat grown in the coastal areas may be explained as due to increased accumulation of Na^+ and Cl^- and a decrease in K^+ content.

A decrease in yield under salinity condition is also reported in chickpea (Lauter and Munns, 1966) and in finger millet (Onkware, 1993).

This decrease in yield of maize and wheat may be attributed to a decrease in chlorophyll content (Begum *et al,* 1997), and a decrease in dry matter (Begum *et al.* 1997, 2000) and leaf area (Zhaw, 1989)

A decrease in yield was also observed in green gram (Patil *et al.* 1992) with increasing salinity higher salinity level reduced paddy yield (Ahmed *et al.* 1989). Ahmad and his co-workers, 1989 reported that Na. K ratio is negatively correlated with yield. In the present experiment the observed decreased in yield under salinity can be attributed to an increase in the Na^+ & K^+ ratio accumulate in the plants due to saline environment in keeping with the previous results of Begum and Karmoker, 1997 on wheat and Begum *et. al.* 2000 on maize.

From the experimental investigation of the performance of different varieties of wheat

and maizein the saline aera, it is found that the variety gaurav of wheat is most suitable for saline zone.In case of maize, the most suitable varieties are barnali and BARI bhutta 5. It can thus be concluded that these varieties of wheat and maize can profitably be cultivated in the coastal area, Atkapalia, Noakhali.

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Received : February 28, 2007;
Accepted : August 13, 2007