Khulna University Studies 4(2): 783-786

SEEDLING PERFORMANCE OF CHILLI IN SALINE SOILS

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KUS-02/14-060702

Manuscript received: July 06, 2002 Accepted: May 19, 2004

Abstract: Seedling performance of chilli was investigated in saline soils. The seeds of 18 chilli cultivars were used as plant material. Soil samples were collected from three upazillas viz. Paikghacha, Dumuria and Batiaghata of Khulna district. Among the collected saline soils, soil-1 (Paikghacha) and soil-3 (Batiaghata) responded better where 61.56% seeds germinated. Among the cultivars cv_{12} (Thupi) and cv_{18} (Bogra local for rainy season) performed better. The highest percentage of germination (85.78 %), maximum number of leaves and highest plant height were observed in cv_{18}. Highest vigour (6.11) was in the seedlings grown on soil-1. Seedlings of cv_{18} and cv_{12} showed vigorous growth and the vigour was 8.56 and 8.11 respectively. Thupi (cv_{12}) required fewer days (5.00) for seedling emergence.

Key words: Salinity, Seedling performance, Chilli, Seeds

Introduction

Chillies are the green or dried ripe fruits of pungent forms of *Capsicun annum* L. belongs to the family solanaceae. It forms an indispensable adjunct in every house in the tropical world. It is specially liked for its pungency, spicy taste, and appealing colour. *Capsicum annuum* includes a large number of horticultural varieties and economically the most important (Bose *et al.* 1986).

An ideal medium for growing chilli is a light loamy soil rich in lime. It can be grown in varieties of soils if they are well drained and rich in organic matter. However, acidic and alkaline soils are not suitable for chilli growing (Kaliappan and Rajagopal, 1970). The accumulation of excess soluble salts in the crop root zone adversely affects plant growth. Therefore, plant growth in the saline soils is either restricted or entirely prevented depending on the kind and amount of soluble salts (Allison, 1964).

Coastal and offshore lands constitute 30% of the net cultivable area (NCA) of the country. Out of 2.85 million hectares of the coastal and offshore areas, about 0.833 million hectares are affected by different degrees of soil salinity. The saline area represents 52.8% of the NCA in 64 upazillas of 13 districts (Karim *et al.* 1990). Khulna region is one of the important zone regarding extent of salinity and the area under saline soil where degree of salinity ranges from 2 dS/m to 16 dS/m (Huq and Iqbal, 1995).

Though chilli can be grown in saline soils but the germination and sedling vigour of plants is affected by salinity in the soil. The germination of chilli crop is found to be satisfactory up to a salt level of 4000 ppm with a soil pH of 7.6 and EC 0.2 (Kaliappan and Rajagopal, 1970). In this circumstances the present study was conducted to identify the salinity tolerant chilli cultivar(s) regarding germination and seedling performance in saline soils.

Materials and Methods

The research work was carried out in Horticultural Laboratory, Agrotechnology Discipline, Khulna University, Khulna, Bangladesh. In this study 18 chilli cultivars were used as plant material. The collected cultivars are mostly indigenous, some are under trial to develop new varieties and the others are locally cultivated in Khulna region of Bangladesh. Soils of three upazillas, viz. Paikghacha (Soil 1), Dumuria (Soil 2) and Batiaghata (Soil 3) of Khulna district were used as soil materials. The soil salinity of the sample area ranged from 2.94 to 4.64 dS/m. Seeds of 18 chilli cultivars were collected with the help of Bangladesh Agricultural Development Corporation (BADC), Khulna and Spices Research Centre, Bogra (SRC), Bangladesh.

To find the germination percentage of chilli cultivars, the soils of three upazillas were placed in slightly depressed earthen petridishes. Twenty five seeds were placed in each petridish. Completely Randomized Design (CRD) of experiment was followed with three replications.

Some selected parameters such as germination percentage, days required for seedling emergence, number of leaves, plant height, vigour etc. were under consideration in this study.

Percentage of seed germination was observed from 5 days after placing the seeds up to 15 days onward. The data were collected everyday, Percentage of germinated seeds was calculated as follows—

$$\text{Percent Germination} = \frac{\text{Number of germinated seeds}}{\text{Total number of seeds placed for germination}} \times 100$$

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DOI: https://doi.org/10.53808/KUS.2002.4.2.0214-L

The days required for seedling emergence was recorded for each cultivars. On 18th day of placing the seeds in petridish, the germinated seedlings were transferred to the pots containing three type soils collected from three upazillas to find the establishment capacity of the seedlings of the cultivars under study. Numbers of leaves were recorded from the established seedlings in pots at an interval of 15 days up to 60 days of placing. Plant height of the established seedlings was recorded at an interval of 15 days up to 60 days of placing. Vigour of the cultured seedlings was measured within a scale of 1-10 on assumption. Collected data on different parameters were statistically analyzed and evaluated by "F" variance test. The differences of the means were evaluated following Least Significant Difference Test (LSD) (Gomez and Gomez, 1976).

Results and Discussion

The seeds of 18 cultivars were examined for selected parameters and the results have been presented in table 1 and table 2. The germination percentage of the seeds of different cultivars in different soils was statistically non-significant (table 1). In soil-3 (Batiaghata) it was maximum (61.56%) than the others and lowest germination percentage (60.89 %) was observed in soil-2 (Dumuria). The number of seedlings was counted in every alternate day starting from the fourth day after sowing. From the fig. 1 it is clear that the number of seedlings increasing quickly after third date of data collection and a bit decline was observed on sixth day of data collection. From the graph it seems that seedling emergence is earlier in soil-1 (Paikghacha). The number of seedlings is also higher in soil-1.

Table 1. Effects of different saline soils on different parameters under study

Soils	Days required for seedling emergence	Germination percentage	Number of leaves	plant height (cm)	Vigour (Scale 1-10)
1	8.94	61.26	2.56	3.83	6.11
2	9.61	60.89	0.07	0.07	6.00
3	9.72	61.56	2.61	3.74	5.82
Level of significance	NS	NS	0.01	0.01	NS

NS = Non Significant Soil-1 = paikghacha, Soil-2 = Dumuria, Soil-3 = Batiaghata

Table.2 Effect of cultivars on different parameters under study

cultivar	Days required for seedling emergence	Germination percentage	Number of leaves	Plant height (cm)	Vigour (Scale 1-10)
cv_1	8.78	69.78	1.78	3.13	6.89
cv_2	9.67	77.33	2.00	3.05	7.44
cv_3	8.00	59.56	1.56	1.70	5.78
cv_4	9.78	61.78	1.67	2.03	6.00
cv_5	11.11	47.11	1.44	2.64	4.78
cv_6	10.89	56.00	2.67	3.81	5.56
cv_7	10.56	74.67	2.67	3.86	7.11
cv_8	10.67	39.11	1.56	2.24	3.89
cv_9	9.44	67.11	2.44	3.76	6.44
cv_{10}	11.00	76.44	0.78	1.24	7.44
cv_{11}	12.22	15.11	1.22	1.29	1.56
cv_{12}	5.00	80.44	1.22	2.23	8.11
cv_{13}	7.56	62.67	0.44	0.41	6.11
cv_{14}	8.22	11.56	1.22	2.00	1.22
cv_{15}	7.56	77.78	1.89	2.31	7.22
cv_{16}	10.11	72.44	1.89	2.97	7.22
cv_{17}	10.44	67.56	2.22	2.84	6.22
cv_{18}	8.67	85.78	2.78	4.29	8.56
Level of significance	0.01	0.01	0.01	0.01	0.01

cv_1 = Hybrid
cv_2 = Alsijan
cv_3 = Baromashi
cv_4 = Baroipaila
cv_5 = Jia
cv_6 = Surjamukhi
cv_7 = Bogra
cv_8 = Irat
cv_9 = Pauja
cv_{10} = Bunniseed
cv_{11} = Aman Lamba
cv_{12} =Thupi
cv_{13} = Gajirhati
cv_{14}= Borjalamba
cv_{15} = Paila
cv_{16} = Aus
cv_{17} = Bogra local (for winter season)
cv_{18} = Bogra local (for rainy season)

The findings from other researchers (Depestre and Gomez, 1990; Lombardo *et al.*, 1996 and JumSoon *et al.* 1999) reveal that the salinity level of the medium affects on germination capacity of the seeds. In the present study the soils used as medium carried little differences in respect of salinity and for this reason the germination percentage of the seed used showed non-significant differences. The level of salinity of the soils

used in the experiment ranged from 2.94 to 4.64 dS/m. Such level of salinity has less effect on the germination percentage of seeds. The findings of Lombardo *et al.* (1996) supported the obtained result in the study. He found that salinity had no effect on germination up to a value of 5 dS/m but a salinity of 20 dS/m reduced germination in Capsicums.

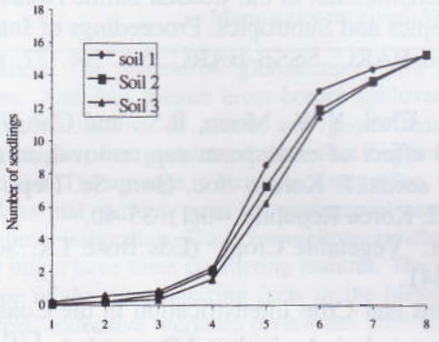

Fig.1 Status of seedlings in different soils

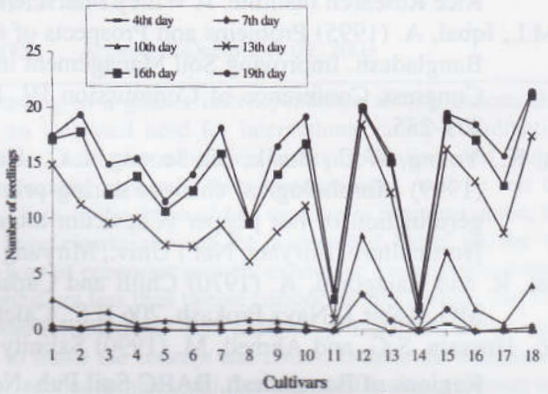

Fig.2. Status of seedling emergence according to variety

Among the cultivars significant differences were observed in respect of germination percentage. The germination percentage was very well (above 75%) in cv_2 (Alsijan), cv_{10} (Bunniseed), cv_{12} (Thupi), cv_{15} (Paila) and cv_{18} (Bogra local for rainy season) but cv_{18} showed highest germination percentage (85.78%) (Table 2). Seedling emergence was earlier in cv_{12} and cv_{15} (Fig. 2). On the fourth and seventh day the number of seedlings was higher in cv_{12} and cv_{15}. The cultivars cv_{18}, cv_3 (Baromashi) and cv_1 (Hybrid) started germination on seventh day but most of the cultivars started germination on 10^{th} day (Fig. 2). In most of the cultivars the number of seedlings was very well on 13^{th} day. Highest number of seedlings was observed in cv_{18}. The number of seedling is also well in cv_{15}, cv_{12}, cv_{10} and cv_2. On 19^{th} day the new seedling emergence was stopped (Fig. 2). Germination of chilli seeds may differ due to varietal differences. Such finding was found by Miyamoto *et al.* (1985) where chilli pepper (cv New Mexico 4-6) germinated well at 23 dS/m.

Among the soils, soil-2 required less time (8.94 days) for seedling emergence (Table 1) and among the cultivars cv_{12} required fewer days (5.00 days) and cv_{11} (Aman Lamba) required maximum days (12.22 days) for seedling emergence than the others (Table 2). Significant difference was observed among the soils in respect of number of leaves. Maximum number of leaves was observed in the seedlings grown on soil-3 (2.66) (table 1). Significant difference was also observed within the chilli cultivars under consideration regarding number of leaves. cv_{18} showed maximum number of leaves (Table 2). There was significant difference in plant height in respect of different soils. In soil-1 the plants showed maximum plant height (3.83 cm) and minimum was in soil-2. Regarding this parameter the cultivars were significantly different. The highest plant height (4.29 cm) was observed in cv_{18} during the study period. Highest vigour (6.11) was observed in the seedlings grown on soil-1 (Table 1). Significant difference was observed, among the cultivars in respect of vigour (table 2). Vigour of the seedlings of different cultivars varies due to genetic characteristics. Deka and Irulappan (1992) screened chilli genotypes to study salinity tolerance and he found that the genotypes LCA, 206, Co1 and LCA 248 grown well, 9 grown moderately and 5 were susceptible. This experimental result supports the result of current study where cv_{18} and cv_{12} responded very well and the vigour was 8.55 and 8.11 respectively.

Conclusion:

Chilli can be grown in saline soils but the germination and early vigour of plants are affected by salinity in the soils. From the study it has been revealed that collected saline soils of Khulna district were suitable for chilli cultivation and V_{12} (Thupi) and V_{18} (Bogra local for rainy season) performed better in those saline soils. So there is an ample scope of chilli production in saline soils of Bangladesh and such type of research should be conducted more to find out most suitable cultivar(s) for saline areas.

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