Abstract: Waterlogging is a condition due to which oxygen does not transport efficiently and loss of essential ions takes place. The topic which was under research was effect of water logging on Maize (Zea mays L.) plants. For this we selected three treatments of different water and each have four replicates. The CRD (Complete Randomized Design) was used for this experiment. The research work was completed in one and half months to complete. During this period the growth parameters were observed under the effect of water logging. As the fact, oxygen is 10,000 times more diffused in air as compared to water. So, the plants which were given the treatment of excess water, their yield was not better as water logging influenced their growing points which were present below the soil. It was also noted that the leaves which were present on the lower portion of the plant they show leaf senescence and became bronze in colour. Hence, the conclusion is that water logging influence the growth and yield of Maize plant.

Key words: Maize • Water logging • Growth Parameters

INTRODUCTION

Maize (Zea mays L.) assumes its cultivation under much diverse agro climatic zones extending from subtropical to cooler temperate regions. Therefore inevitably the crop remains open to varied types of biotic as well as abiotic stresses. Among the various abiotic temporary water logging, due to heavy rains or high ground water table or heavy soil texture is one of the most important constraint for maize production and productivity in Asian regions [1]. In South and Southeast Asia alone, over 18% of the total maize growing areas are frequently affected by floods and water logging problems [2]. Respiration by plant roots, soil micro-flora and fauna leads to a rapid exhaustion of soil oxygen, resulting in hypoxia followed by anoxia. Unlike rice plants, maize plants have no naturally occurring air spaces in their roots. Therefore, as a result of the gradual decline in oxy-gen, plant roots suffer hypoxia (low oxygen) followed by anoxia (no oxygen) when faced with pro-longed (>3 days) excess soil moisture [3, 4]. An effective breeding strategy for developing water logging tolerant cultivars primarily depends on a sound knowledge and understanding of the in-heritance mechanism of the stress tolerance in tropical maize. Studies on the combining ability of water logging stress tolerance in Indian maize have been attempted [5, 6]. Maize is generally considered to be a flood tolerant species due to its ability to produce early adventitious roots and morphological adapters (arenchyma) during excess soil moisture conditions [7, 8]. In monsoon sowing it is difficult to avoid water logging at one or other stages of crop growth due to erratic rains. Further low lying area also faces severe water logging problems during winter season sowings. The tolerance of maize genotypes towards this particular type of stress varies considerably and is highly influenced by the degree of stress and the genotype of the plant [9].

MATERIAL AND METHODS

The work under consideration was conducted outdoor within pots experiments at Hafiz Hayat Campus in University of Gujrat (UOG). Seeds of maize were purchase from a local shop of Gujrat and variety of these seeds was Neelam. Healthy seeds were purchased but to check that whether the seeds were healthy or not we placed seeds in beaker containing water. Most of the seeds settled down in bottom which showed that seeds were healthy. Medium size pots were taken from
nursery of UOG. Experimental design was CRD (Complete Randomized Design) number of pots were 12. Soil was also taken from nursery a little amount of sand was added to the soil for better growth of plants. Seeds were sown on 20-4-2013. Germination of seeds was observed on 28-4-2013. After 12 days of germination, waterlogging treatment was applied to the plants. Number of treatments were three (T0, T1, T2). There were 4 replicates each treatment.

T0: 200ml (Distilled Water)
T1: 400ml (Distilled Water)
T2: 600ml (Distilled Water)

Plants were uprooted carefully and washed in distilled water. Shoot and root length was measured with the help of scale meter in cm and root dry weight, shoot dry weight, root fresh weight and shoot fresh weight in gram with the help of electrical balance. The shoot and root was measured with scale. Morphological parameters were studied and compared with control. Analysis of variance technique for the data was computed for all attributes by using COSTAT for DOS computer program version 3.03. Bar graphs values were drawn by using Microsoft Excel software.

RESULTS AND DISCUSSIONS

The root and shoot length of the maize was decreases with the increase in the water level. The maximum growth was shown in the control of both parameters and the minimum reduction was observed in the T2 of the root length and the in the case of shoot length the minimum reduction was also noted in T2 which the higher level of water applied to the maize. (Fig. 1. a., b.) The Analysis of variance also shows the significant result due to the reduction in the length of root and shoot. The roots has direct interaction with the water and by the increasing the level of water the root systems was destroy which ultimately results in the reduction of shoot length similar results were obtained by Rathore et al., [10] and Savita et al. [11].

The shoot fresh and dry weight was decreased with the similar trend. The minimum weight was recorded in the replicates of T2 (Fig. 1. c., d.) and in the case of root fresh and dry weight T2 has the minimum weight which is 0.11 gm. for the fresh root weight and the dry weight of the root is 0.061 gm. In Fig. 1 e. and f. these effects were show and the ANOVA also show the significant results as shown in Table: 1. these results were also reported by Malik et al., [12] that the growth of seedlings of sorghum

Fig. 1: Shows effect of water logging on Root length (a), Shoot length (b), Shoot fresh wt. (c), Shoot dry wt. (d), Root fresh wt. (e), Root dry wt. (f) and leaf area (g) of maize.
Table 1: Means of analysis of variance for Root length, Shoot length, Shoot fresh wt., Shoot dry wt., Root fresh wt., Root dry wt. and leaf area of maize

<table>
<thead>
<tr>
<th>S.O.V</th>
<th>M.S of root length(cm)</th>
<th>M.S of M.S of root length (cm)</th>
<th>M.S of shoot length (cm)</th>
<th>M.S of shoot fresh weight (gm.)</th>
<th>M.S of shoot dry weight (gm.)</th>
<th>M.S of root fresh weight (gm.)</th>
<th>M.S of root dry weight (gm.)</th>
<th>M.S of leaf area (cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of water logging</td>
<td>2</td>
<td>7.786*</td>
<td>3.056*</td>
<td>2.056**</td>
<td>10.943ns</td>
<td>0.336ns</td>
<td>0.014*</td>
<td>0.008**</td>
</tr>
<tr>
<td>Error</td>
<td>9</td>
<td>4.075</td>
<td>0.104</td>
<td>0.102</td>
<td>1.995</td>
<td>0.411</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td></td>
<td></td>
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</table>

is also affected by short-range waterlogging is pointed by high death rate of seedlings, decline in NAR, LAR and RGR. Lower nitrogen concentration in main stem of wheat plant results in minimized yield of tiller and adversely affect RGR. [13]. The ultimate lengths of adventitious roots are restricted [14]. Eventually, mutually root and shoot dry weight is decreased [15]. The leaf area was affected by the increase in the water level because maximum water level inhibits the growth of plant which ultimately reduced the number of leaf and leaf area in the Fig. 1; the results of leaf area was shown which in minimum in T2 treatment. Water logging also restricts the wheat plant’s uptake of nutrients by reducing transpiration and restricting root function [16].

The changes brought about by water logging in cotton includes reduction of stomatal conduction, leaf potential and the rate of photosynthesis [17]. Water logging can also hasten leaf and root senescence. In cottonwater logging also amends the accessible nutrients through various means [18].

REFERENCES


