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Effect of NiCl on the Morphology of *Sorghum bicolor*

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Abstract: To check the effect of NiCl on Sorghum the experiments were conducted in the Lab. After applying the treatment, of 30ppm, 60ppm and 90ppm on T_1, T_2 and T3 respectively the effect of heavy metal (NiCl) on the morphological parameters of the plant were observed. T_0 was used as a control each has a 4 replicates R_1, R_2, R_3, R_4. In morphological parameters number of leaves, shoot length, Root length, Shoot Dry Weight, Leaf Area/ plant, Relative Growth Rate (RGR), Net Assimilation Rate (NAR), Specific Leaf Weight.

Key words: Sorghum bicolor · NiCl · UOG · Pakistan

INTRODUCTION

Sorghum bicolor L. is an important crop due to its wide use as food, feed and energy crop. In addition, sorghum appears promising as a cereal crop, which has some non-food uses, particularly for bioethanol production [1]. Sorghum (*Sorghum bicolor L.*) is grown as a fodder crop in Pakistan. Sorghum is a crop of worldwide importance. It is unique in its ability to produce under a wide array of harsh environmental conditions. It used for food as grain, fodder, the production of alcoholic beverages and biofuels. Most varieties are drought and heat-tolerant. Its growth is best in high temperature and sunny condition [2]. Sorghum is able to accumulate large quantities of metals in shoots grown in hydroponic conditions but in field trials these amounts are lower [1]. Nevertheless, one advantage is the possibility of some economic returns during the process. Sorghum has high production of biomass in comparison with other crops such as sunflower or corn [3]. In this study we deal with the morphological and biochemical effects of NiCl in Sorghum.

MATERIAL AND METHODS

Influenced salt stress on Sorghum plants was examined during April-May 2013. Healthy seeds of Sorghum (*Sorghum bicolor* L.) were obtained from Maher seeds cooperation Wazirabad, Pakistan. This research is focused on the effect of heavy metal on sorghum. Lab experiments were performed to check the effect of heavy metal (NiCl) on the morphology of Sorghum in the Botany Department lab, University of Gujrat. For this purpose, sorghum seeds were grown in 16 pots in the University of Gujrat. After the germination of seeds, chemical treatments of NiCl were applied on the plants. After applying the treatment, of 30ppm, 60ppm and 90ppm on T_1, T_2 and T3 respectively the effect of heavy metal (NiCl) on the morphological parameters of the plant were observed. T_0 was used as a control each has a 4 replicates R_1, R_2, R_3, R_4.In morphological parameters number of leaves, shoot length, Root length, Shoot Dry Weight, Leaf Area/ plant, Relative Growth Rate (RGR), Net Assimilation Rate (NAR), Specific Leaf Weight (SLW), Leaf Area were absorbed.

Plant Material: Finally the pots were named as T_0, T_1, T_2 and T_3. Each has 4 replicates named as R_1, R_2, R_3 and R_4.

Root Measurement cm: Wetake the plant in the lab and washed out with distilled water and measure the root length with the help of scale.

Shoot Length cm: Wetake the plant in the lab and washed out with distilled water and measure the shoot length with the help of scale.

Leaf Area cm^2: Wetake the plant in the lab and washed out with distilled water and measure the Leaf Area with the help of scale Because Sorghum belongs to monocotyledons family.

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Leaves Counting: Leaves of each plant were counted when the experiment was start at the sampling day.

Specific Leaf Weight (SLW): Specific leaf weight for each plant was counted by taking dry plants and readings were recorded.

Relative Growth Rate (RGR): Relative growth rate was calculated after the final harvest and readings were recorded.

Net Assimilation Rate (NAR): Net Assimilation rate was calculated after the final harvest and readings were recorded.

Statistical Analysis: Data for each attribute were subjected to CoStat Computer Program for calculating ANOVA.

RESULTS AND DISCUSSION

Our results showed that the sorghum plants when treated with the solutions of heavy metal. Plants showed great variety in their ability to response against heavy metal [4]. Cultivars differed significantly in relation to all these attributes. While comparing different sorghum cultivars in relation to shoot dry weight it was evident that maximum reduction in shoot dry weight was recorded at T3 (90ppm) due to salt stress and the minimum reduction was recorded at T1 (30ppm) However, in relation to root dry weight this salt-induced reduction was greater in T3 (90ppm) was and lesser reduction at T1 (30ppm) of salt stress significantly reduced the shoot and root.

ANOVA was applied on the results. And the final values for all the parameters were as follows;

Source	df	M.S of Number of leaves	M.S of Leaf Area	M.S of Leaf Area/Plant	M.S of Specific Leaf weight	M.S of Shoot Dry weight	M.S of Leaf Fresh weight	M.S of Relative growth rate	M.S of Net assimilation rate	M.S of Leaf area ratio (cm^2/g)
NiCl	3	0.417ns	124.989**	2594.11**	16.126ns	0.168ns	0.304ns	0.0617ns	6.923ns	782.646ns
Error	12	0.375	119.196	2617.842	53.16	0.098	0.142	0.167	8.426	1584.733
Total	15									

Graphs for the results are as follows.

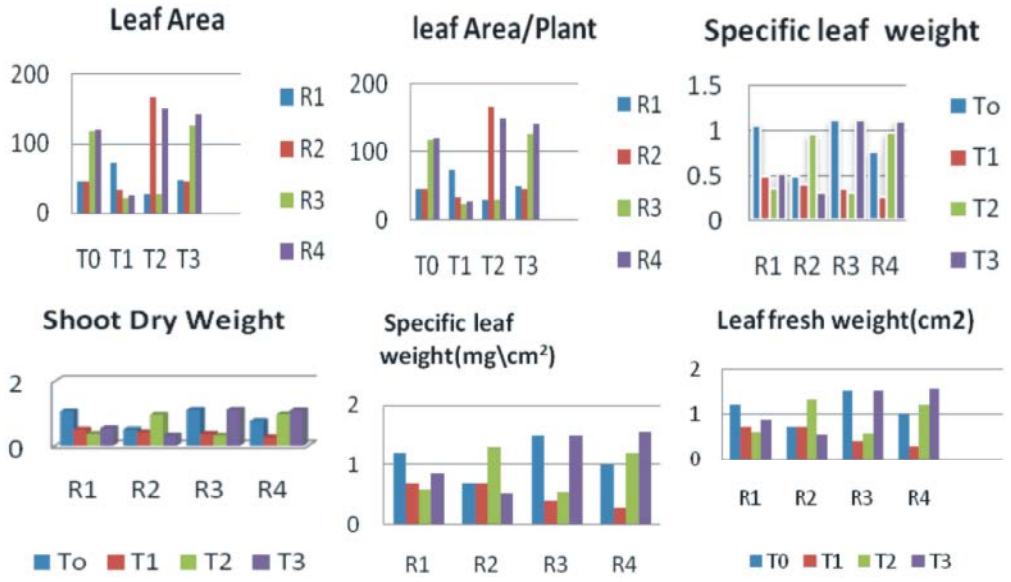

Fig. 1(a): leaf area
Fig. 1(b): leaf Area/Plant
Fig. 1(c): Specific leaf weight
Fig. 1(d): Shoot dry weight
Fig. 1(e): Specific leaf weight
Fig. 1(f): Leaf fresh weight

List of graphs: (a) Leaf area (b) Leaf area/plant (c) specific leaf weight (d) shoot dry weight (e) specific leaf weight (f) leaf fresh weight

In the root length the maximum reduction was recorded at the T3 level (90ppm) and the minimum reduction at T1 level (30ppm).

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