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Research Article

EFFECT OF POTASSIUM ON GROWTH OF *BRASSICA*

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ABSTRACT
The effects of potassium on the germination of brassica were investigated. The experiments were carried out in Pots under photo periodic conditions. The results show that coefficient of germination velocity of the brassica seeds decreased with increase in concentrations of the metal solutions in the medium. The results also showed that potassium did not inhibit germination of Brassica seeds but impaired the growth and seedling establishment. The present study also reports that suppression of the germination of the Brassica seeds manifested in delay in germination with increase in concentrations of potassium. The highest concentrations of potassium that did not support seedling growth were 1.5 solution.

Keywords: *Brassica, Potassium, Germination, Growth, Shoot-Root Ratio*

INTRODUCTION
Brassica is a genus of plants in the mustard family named as Brassicaceae. The plants of the genus are collectively known as cruciferous vegetables including the cabbages, mustards. Crops of this genus are occasionally called Cole crops, which is derived from the Latin caulis, mean (stem, cabbage).
Brassica which are commonly used for food include cabbage, cauliflower, broccoli, Brussels sprouts. This genus is also known for having many vital horticultural and farming crops. It also contains a number of weeds, both the natural (wild), and cultivated crops. Wild and hybrid include 30 species and many additional cultivated and hybrids of cultivated origin. Most are annuals but biennials are also present, and some are small plants. Brassica plants have been the subject of much scientific interest and it is due to their agricultural importance. Particularly six vital species (*B. juncea, B. oleracea, B. Carinata, B. napus, B. nigra and B. rapa*,) are derived by combining the genes from three earlier species.
This genus is native in their natural habitat in temperate regions of Asia, Western Europe, the Mediterranean. In addition to the cultivated species, they are grown in worldwide, and most of the wild (natural) species are grows as weeds, especially in North America, South America, and Australia.

MATERIALS AND METHODS
In this Shoot-root ratio (by weight), dry matter partitioning, and growth analysis of brassica was investigated under excessive potassium applications in pot experiment at Dry land during winter. The experiment was performed in randomized design with three replicates. The four treatments were: T0= Control, T1= 6ppm, T2= 9ppm and T3= 12ppm.
Seed was sowed in every pots. Water was given to every pot. The pots were maintained at the field capacity during whole growing season. One week after emergence, plants were thinned to 3 plants per pot. Fresh pots (treatments) were maintained for the three growth stages i.e. 7, 14 and 21, days after emergence (DAE). All the 3 plants were uprooted from each pot at 7, 14 and 21 DAE and the data were recorded as the average of three plants. The roots of the plant were cleaned with water and the plants were then divided into three parts i.e. roots, leaves, and stems, and length of root, shoot and fresh and dry weight was also taken.
Also number of branches, number of leaves note down and width of shoot and root also taken and the average length of root, leaf and stem per plant were determined.

Statistical Analysis
Data were analyzed of variance (ANOVA) according to the methods described in Torrie *et al.*, (1980) and treatment means were compared using the least significant difference (LSD) using MSTAT-C software.

RESULTS AND DISCUSSION

Result

The growth of brassica decreased with the excessive amount of potassium with the passage of time. Here, we analyzed different parameters under different concentration of heavy metal potassium on brassica. We draw plots for each case and observe the different values of parameters for each ppm of the potassium on brassica. From the tables, we come to know that number of leaves and branches and all other parameters increases normally, but for metal application we observe a decrease in them. Most of the brassica seedlings turned yellow at three days, before they died. The yellow coloration is attributable to chlorosis (Bernstein, 1961). Shweta *et al.*, (2006) reported that the characteristic feature of toxicities in plants due to heavy metal is chlorosis (yellowing) and reduced in net photosynthetic rate which leads to decrease in plant growth and productivity.

Discussion

The various levels of potassium used in the germination and growth study did not substantially prevent seed germination. Metals such as chromium and aluminium have also been reported not to effect the germination but affect the seedling and growth also by according to (Rellen-Alvarez *et al.*, 2006).

In the present study, suppression of the germination of the brassica seeds manifested in delay in germination with increase in concentrations of potassium, and solutions. The concentrations of potassium that did not support seedling growth were 1.5 solution. However, only few Brassica seedlings (15- 40%) enjoyed this support. The ability of low concentrations of metals that will increase the plant performance was also reported by Jamal *et al.*, (2006) and Jaja and Odoemena, (2004). The shoot growth response decreased with increase in concentration of the metal salt in the growing media. This linear dimension growth study shows that increased levels of metal concentration produced Brassica growth inhibition to the extent of seedling mortality. Adhikari *et al.*, (2005) also reported that above 80mg potassium per kilogram soil, there is very slow growth of brassica after germination. Most of the brassica seedlings turned yellow at three days, before they died. The yellow coloration is attributable to chlorosis (yellowing) (Bernstein, 1961).

Table 1: Effect of Potassium Toxicity on Growth of Brassica after 1 Week

Treatments	No. of Leaves	No. of Branches	Root Length	Shoot Length	Leaf Area	Root Fresh Weight	Shoot Fresh Weight	Root Dry Weight	Shoot Dry Weight	Chl. Contents
T0 Control	10	10	8.93	20.7	28.5	3.03	4.13	2.26	3.8	0.75±0.009
T1(6ppm)	10	10	11.23	19.8	27.8	3.31	4.15	2.3	3.9	0.65±0.01
T2 (9ppm)	12	12	10.63	16.9	20.6	3.40	4.21	2.5	4.0	0.55±0.015
T3 (12ppm)	10	10	10.26	19.13	25.6	3.01	3.99	2.01	2.99	0.49±0.013

Table 2: Effect of Potassium Toxicity on Growth of Brassica after 2 Weeks

Treatments	No. of Leaves	No. of Branches	Root Length	Shoot Length	Leaf Area	Root Fresh Weight	Shoot Fresh Weight	Root Dry Weight	Shoot Dry Weight	Chl. Contents
T0 Control	27	27	12.46	7.8	16.4	2.03	3.23	1.6	2.83	0.78±0.010
T1(6ppm)	29	29	12.17	21.8	29.3	2.66	3.13	2.26	2.83	0.60±0.015
T2(9ppm)	20	20	13.9	9.56	26.2	1.5	3	0.9	2.267	0.50±0.013
T3 (12ppm)	25	25	12.84	13.05	23.9	2.51	3.09	2.01	2.75	0.40±0.0012

Table 3: Effect of Potassium Toxicity on Growth of Brassica after 3 Weeks

Treatments	No. of Leaves	No. of Branches	Root Length	Shoot Length	Leaf Area	Root Fresh Weight	Shoot Fresh Weight	Root Dry Weight	Shoot Dry Weight	Chl. Contents
T0 Control	23	23	8.2	4.36	17.1	1.533	5.033	1.033	2.066	0.80±0.012
T1 (6ppm)	8	8	8.1	4.31	17.2	1.532	5.031	1.21	2.199	0.55±0.012
T2 (9ppm)	7	7	7.89	4.34	17.4	1.529	5.029	1.09	2.20	0.45±0.01
T3 (12ppm)	8	8	8.0	4.33	17.0	1.531	4.991	1.07	2.21	0.35±0.010

Table 4: Effect of Potassium Toxicity on Growth of Brassica after 4 Weeks

Treatments	No. of Leaves	No. of Branches	Root Length	Shoot Length	Leaf Area	Root Fresh Weight	Shoot Fresh Weight	Root Dry Weight	Shoot Dry Weight	Chl. Contents
T0 Control	24	24	8.93	20.7	28.5	3.03	4.13	2.26	3.8	0.90±0.013
T1(6ppm)	27	27	12.46	7.8	16.4	2.03	3.23	1.6	2.83	0.55±0.010
T2(9ppm)	29	29	12.17	21.8	29.3	2.66	3.133	2.266	2.833	0.40±0.01
T3 (12ppm)	20	20	13.9	9.56	26.3	1.5	3	0.9	2.267	0.30±0.09

Conclusion

The study showed that potassium did not inhibit germination of brassica seeds but impaired the growth and seedling establishment. The brassica seedlings showed more tolerance to potassium than any other metal tolerated more potassium than any other metal.

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