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Effects of Potassium Sulphate on Seed Germination and Growth of Bottle Gourd

Dr. M. Nafees Iqbal*

Abstract

In present studies was concluded that the Potassium Sulphate treatment produced toxic effects on seed germination and seedling growth of water melon along with significant reduction in seedling dry weight as compared to control treatment. Similarly, the tolerance to copper treatment decreased the tolerance indices for water Bottle guard seedlings with the increase in metal concentration in the substrate as compared to control.

The difference in tolerance and seedling vigor index in response to Potassium Sulphate toxicity should be considered while Bottle guard cultivated in potassium contaminated areas. There is a need to be carried out further studies on other Potassium Sulphate tolerant species for plantation in Potassium Sulphate contaminated areas to overcome the shortage of agriculture crops.

Keywords: Bottle Guard, Germination, Copper Sulphate, Shoot, Roots and seedling etc.

INTRODUCTION

Bottle gourd (*Lagenaria siceraria (*Mol) Standl.) belonging to family Cucurbitaceae cultivate throughout India. It cultivates under special cultivation practices which required for better growth and yield

Soil

Sandy loamy soils rich in organic matter with good drainage and the pH ranges from 6.5 to 7.5 is suited for bottle gourd cultivation. This crop requires a moderate warm temperature.

Season

July and January are suitable for sowing

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Seed Rate

1.5 kg/ha.

Varieties

CO 1, Pusa Summer Prolific long, Pusa, Summer Prolific Round, Pusa Manjari, Pusa Megdoot and Arka Bahar

Seed Treatment

Treated with *Trichoderma viride* 4 g or *Pseudomonas fluorescens* 10 g or Carbendazim 2 g/kg of seeds before sowing

Preparation of Field

Plough the field to fine tilth and dig pits of the 30 cm x 30 cm x 30 cm size at 2.5 x 2 m spacing.

Sowing

Sow the seeds @ three seeds/pit and thin the seedlings to two/pit after 15 days.

Irrigation

Irrigate the field before dibbling the seeds and thereafter once a week.

Application of Fertilizers

Apply 10 kg of FYM (20 t/ha), 100 g of NPK 6:12:12 mixture/pit as basal and 10 g of N/pit 30 days after sowing.Apply Azospirillum and Phosphobacteria 2 kg/ha and Pseudomonas 2.5 kg/ha along with FYM 50 kg and neem cake @ 100 kg before last ploughing.

Drip Irrigation

Install drip system with main and sub-main pipes and place the inline lateral tubes at an interval of 1.5m. Place the drippers at an interval of 60 cm and 50 cm spacing with 4LPH and 3.5LPH capacities respectively.

Field Preparation

Form raised beds of 120 cm width and place laterals in the centre of bed.

Nursery Raising

In hi-tech horticulture, plant 15 days old healthy seedlings raised in shade net houses. Raise the seedlings in portrays having 98 cells or in polythene bags. Transplant about 15 day's old seedlings in the main field.

Fertigation

Apply a dose of 200:100:100 kg NPK/ha throughout the cropping period through split application.

Fertigation Schedule-Bottle Gourd (Hybrid) Recommended Dose: 200:100:100 Kg/ha

Soil salinization is one of the major factors of soil degradation. Salinity inhibition of plant growth is the results of osmotic and ionic effects and the different plant species have developed different mechanisms to cope with these effects. Reduction in osmotic potential in salt stressed planta can be a result of inorganic ion (Na+, Cl- and K+) and complete organic solute (soluble carbohydrates, amino acids, proline, betaines, etc.).

Shen *et al.* (1998) has studied the effect of copper (Cu) and zinc (Zn) toxicity on growth of mung bean (Phaseolus aures Roxb. cv VC- 3762) in a solution culture. The mechanisms involved in heavy metal tolerance may range from exclusion, inclusion and accumulation of heavy metals depending on the plant species (Munzuroglu and Geckil, 2002; Kaushik *et al*., 2005; El-Tayeb *et al*., 2006). Many scientists have reported a progressive decrease in growth with increase in osmotic pressure ofthe salt solution. Similar to these findings, Joshi and Singh (1974), Sheoran and Garg (1978), Reddy and Vora (1983) reported a delay in germination and decrease in seedling growth with increasing levels ofsalinity.

Extensive work has been done on specific toxicity of CF ion on different plants and its effect on metabolism of different plant components. About the Na+ ion, toxic effect develop even before the level of exchangeable sodium is high enough. Martin and Bingham (1954) found Na+ ion, toxicity in Avocado with as little as 4 ESP. Sensitivity to salinity of citrus, peach and beet have been studied by different workers.

Germination studies for different plants have been carried by Millington et al (1951), Kapp (1974). According to Iwaki and Ota (1952) germination of *Oryza* species takes place with water containing 0.6% NaCl. Kapp (1974) considers that germination of Oryza was affected at a salt content of 825 lbs/acre, whereas 3300 lbs/acre was required to affect yield when applied to 6-week-old plants.

Thus some plants are much more sensitive towards salinity during germination and early seedling growth and some are during later stages of development.

Cerighill and Durand (1954) found that low concentration of NaCl appears to stimulate the development of *Oryza sativa* but then increase in concentration becomes rapidly damaging. Strogonov (1964) has studied salinity aspect in relation to *Gossypium herbaceum*.

Material and Methods

The seeds were either collected from the cultivated plants or procured from local market. They were stored in dry and stoppered glass bottles in dark. Studies on seed germination were conducted in sterilized petri dishes lined with a single layer of whatman no.1 filter paper kept moist with distilled water or test solution. They were imbibed in distilled water or test solution (10ml) in dark for 6 to 8 hours. The studies involved use of 200 seeds of water melon in different concentration along with distilled water as control for 6 h. The seeds were then transferred to with cocopeat containing Germination tray respective solution of copper sulphate concentration and distilled water. The germination tray was incubated at green shed net (polyhouse) condition still germination and Then percent germination was calculated on the basis of seed germination and also Seedling height, root length, and the biomass of seedling were measured.

$$\text{Seed Germination \%} = \frac{\text{Total Number of seeds germinate in particular treatment}}{\text{Total Number of seeds treated in particular treatment}} \times 100$$

The dry biomass was determined by placing the seedling in an oven at 80 °C for 24 hours.

Preparation of Solution

Different Concentration of Potassium Sulphate

Name of Salt	Concentration (ppm)
Potassium Sulphate	30
	60
	90
	120
	Control Distilled water

Taxanomic Studies of Bottle Guard

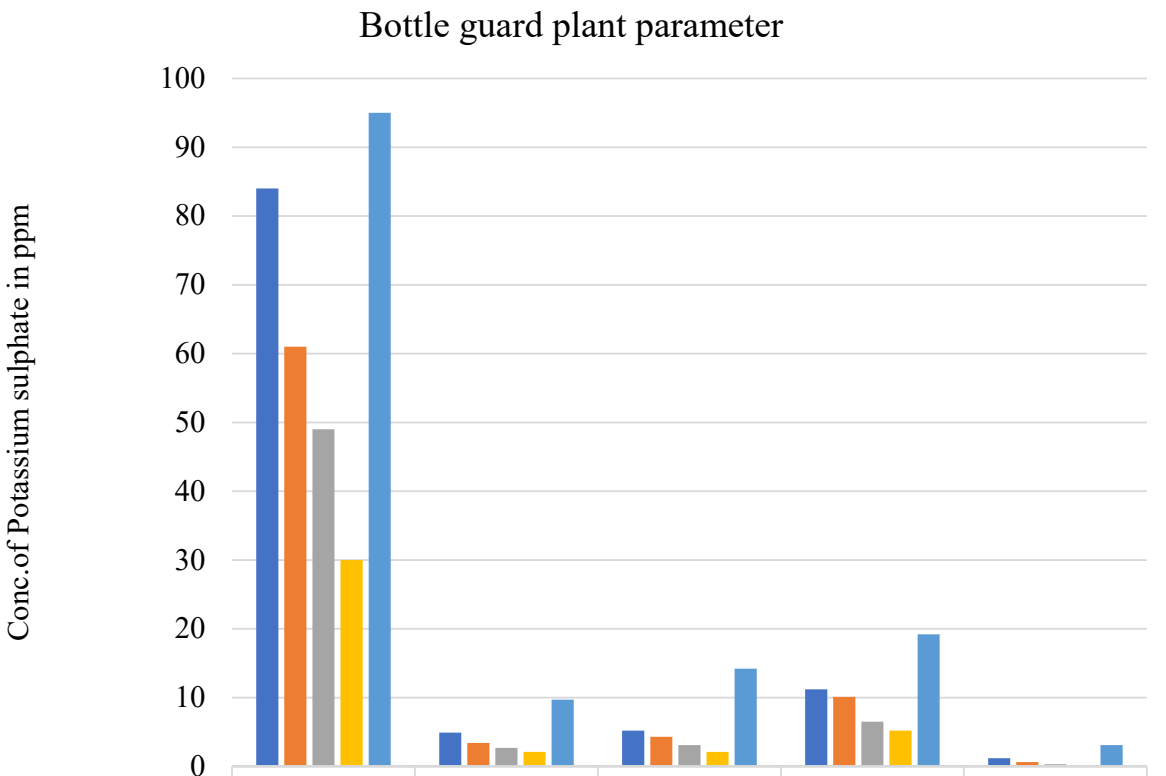
Bottle gourd is an annual herbaceous plant with a prostrate or branching type growth habit. The leaves are alternate and variable, and tendrils (Fig. 1) are almost always present. Flowers of L. siceraria are monoecious in nature, where solitary male and female flowers are found on different plant axis of the same plant, thus cross pollination is highly favourable. Dioecious and andromonoecious sex forms bearing hermaphrodite flowers also exist in wild, non–cultivated types. Like most cucurbits, the sex ratio (male: female) for bottle gourd is high. The proportion of male to female flowers has been shown to affect yield significantly.

According to Desai, environmental conditions (precipitation, temperature and light intensity) and various growth regulators (Auxins, ethylene, gibberellic acid etc) can be used to alter this ratio. Bottle gourd fruit vary widely in shape and size, and this is within or among cultivars. According to Morimoto et al. [38], among the six known species, L. siceraria exhibits the widest variations in fruit shape; these are either long, cylindrical, necked, oblong flat or round, conical pyriform to club shaped, while skin texture varies from warted to smooth. Fruit size varies from 5 to 40 cm wide, and 20 to 90 cm long. Seed forms also differ according to shape, size, presence or absence of frills and seed lines, and seed coat surface

RESULTS AND CONCLUSION

Table No. 1: Effects of Different Concentration of Potassium Sulphate on Seed Germination (%), Seedling Growth and Seedling Dry Weight (g) of Bottle Gourd (Lagenaria Siceraria (Mol) Standl.)

$CuSo_4$ Concentration in ppm	Germination (%)	Root Length (cm)	Shoot Length (cm)	Seedling Size (cm)	Seedling Dry Weight mg/g
30	84	4.9	5.2	11.2	1.2
60	61	3.4	4.3	10.1	0.62
90	49	2.7	3.1	6.5	0.32
120	30	2.1	2.1	5.2	0.12
Control (D/W)	95	9.7	14.2	19.2	3.1



	(%) Germination	(cm) length Root	(cm) length Shoot	size (cm) Seedling	weight mg/g dry Seedling
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The Results showed that seeds treated with distilled water were recorded highest seed germination percentages and also root, shoot, seedling length and dry weight of seedling, followed by seeds treated with Potassium Sulphate decreases the overall growth parameter of seedling mentioned in **Table.1**

DISCUSSION

In present investigation on the effect of Potassium Sulphate on germination, growth parameter of Bottle guard seedling found that the Excessive concentration of Potassium Sulphate generally produce common toxic effects on different growth variable of plants, such as low biomas accumulation, chlorosis, inhibition of growth and photosynthesis, altered water balance and nutrient assimilation, and senescence, which ultimately cause plant death. The plant under abiotic stress conditions are most likely to be adversely affected by heavy metals contamination.

The Results showed that seeds treated with distilled water were recorded highest seed germination percentages and also root, shoot, seedling length and dry weight of seedling, followed by seeds treated with Potassium Sulphate decreases the over all growth parameter of seedling mentioned in **Table.1**

CONCLUSION

In present studies was concluded that the Potassium Sulphate treatment produced toxic effects on seed germination and seedling growth of water melon along

with significant reduction in seedling dry weight as compared to control treatment. Similarly, the tolerance to copper treatment decreased the tolerance indices for water Bottle guard seedlings with the increase in metal concentration in the substrate as compared to control.

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Uses and Opportunities as a Food Security Crop

Bottle gourd is mainly grown as a vegetable for human consumption. However, hard dry shell is often used in utensil and instrument making, hence calabash gourd [. Furthermore, in India different plant parts, especially the fruit juice, can be used as medicine to cure stomach elements. In many parts of the world the young green fruit is a popular cooked vegetable

- Reduces stress. Eating lauki can help in reducing stress.. ..
- Benefits the heart.. ..
- Helps in weight loss.. ..
- Helps in treating sleeping disorders.. ..
- Prevents premature greying of hair.. ..
- Helps in digestion.. ..
- Benefits the skin.

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