Impact of seeds soaking use some microelements on seedling growth of cucumber (*Cucumis sativus* L.)

Hand Jawad Kadiem[1] **Hawrez Ali Nadir[1]**

[1] Sulaimani Polytechnic University - Technical College of Applied Sciences.

Abstract

This study was carried out in Halabja, Technical College of Applied Sciences, during 2016-2017, to evaluate the impacts of soaking seed in some microelements (Zn, Fe and Mn), with distilled water on seedling growth of cucumber (cucumis sativus L.). Cucumbers seed (Habib f1 371325-21-1) was selected to test and observe the germination seeds and seedling growth characteristic. An Experiment was adapted in Randomize Complete Design (RCD) with three replications. Consequently, the concentration of microelements was used 0.5% seeds soaking for 12, 18 and 24 hours. Results showed the maximum seed germination, seedling emergence and maximum dry matter of vegetative part that was taken from Mn+Fe+Zn with Zn -12 hours (100%) and Fe-12hours (57.53%), (1.53gm) and other treatments respectively. The highest length of plant was obtained from Zn-18 hours (13.17cm), and maximum leave area was taken from Mn- 12 hours (17.70 cm^2). And the highest stem diameter is (3.37 mm) from Zn-24 hours. Finally, the lowest germination rate, seedling emergence, plant length, leave area, stem diameter and dry matter were obtained from DW-24 (87.87%), Mn-12 hours and Mn+Zn+Fe -24 hours (24.27 %), control (6.00 cm), (12.73 cm^2), Mn+Zn+Fe- 24 hours (2.87 mm) and DW-18 hours (1.26 gm). In addition, it is thought that the effects of different solutions could lead to improve seedling parameters that benefit in increase of cucumber production.

Keyword: cucumber, microelements, seeds, soaking, seedling.

Introduction

Cucumber (*Cucumis sativus* L.) is belonging to the family of cucurbitaceae, and it is more familiar and very ancient vegetable in the world (Malepszy and Niemirowtcz-Szczytt, 1991; Staub *et. al.,* 1997; Wehner & Guner, 2004; Eifediyi & Remison, 2010). The total species of cucumber are nearly about 750 species (Malepszy and Niemirowtcz-Szczytt, 1991). Also, cucumber contains many different vital elements and water with various vitamins (Hong *et. al.,* 2016). Seeds soaking before sowing are more effective to plant; it makes resistant to the pest and disease as well as seed viability and seedling vigorous (Posmyk *et al.* 2009). Despite, several physiological and morphological characteristic in majority plant are effected by Iron (Fe), manganese (Mn) and Zinc (Zn) deficiency (Romera & Alcántara 1994; Hong *et. al.,* 2016). Mn, Fe and Zn can be found in different part of the plant such as fruit, leaves, roost and stems (D.A. Moreno *et al.,* 2003). The seed germination problem is to delay the germination, hence to attract the pest and diseases in the plant (Romera & Alcántara 1994; Hong *et. al.,* 2016). To minimizing the period of seed sowing to the germination and seedling of cucumber production that is more important to withstand the soil microbiology attack to the seed, the soaking of cucumber seed caused the reducing the period of sowing and germination to the seedling, and seed coat may effect by the microelements (Munzuroglu & Geckil, 2002). Thus, Kurdistan Region- Iraq cucumber freshly and directly consumed by people. Moreover, the production of cucumber increased day to day in the region. The aim of this study is determination the effective of soaking cucumber seeds in some microelements (manganese, iron and zinc) with distilled water on seedling growth.

Material and Methods

This study was carried out in greenhouse on the farm of Halabja Technical College of Applied Sciences, Hlabja, Kurdistan Region- Iraq, from 2016-2017. The hybrid of cucumber species (Habib f1 371325-21-1) was used. The seed divided by some groups; each group is a continent of 50 seeds of cucumber. Then, the seeds were soaking in distilled water (DW) with different solutions manganese (Mn), Iron (Fe) and zinc (Zn), with concentration 0.5%. with control treatment as dry seed (without soaking). Each treatment was soaking in different time 12, 18 and 24 hours, and manganese (MnSO4 - 5H2O), Iron (FeSO4 - 7H2O), and Zinc (ZnSO4 - 7H2O) as source for each treatments.

The seeds were sowing into peatmoss medium in 209 cells transplant trays from (15/4/2017). After twenty days, ten plants randomly selected to observation height of seedling (cm), leaf area (cm^2), dry matter of shoot system part (gm), stem diameter (mm), and seedling emergence (%) was recorded after two days.

The germination rate (%) was recorded after 5 days and 7 days. The dry matters of vegetative part were using the oven at 70 C^0 for 72 hours. Also, the seedling emergence (%) was calculated by the methods was mention that form (Fadhil and Iman, 2005). Then, percentage of seed germination rate was using the following equation.

$$\text{Seed germination (\%)} = \frac{\text{Number of germinated seed}}{\text{Number of total seed}} \times 100$$

Sixteen treatments with three replications were used in the experiment, and the experiment was applied by a complete randomize design (CRD). The data was analyzed by one-way ANOVA followed by "Dunnett's Multiple Comparison Test" at level $P<0.05$, the (Graphpad prism5) used for statically analysis data.

Results and Discussion

Results showed that soaking seed in microelements had a high effect in seed germination. Consequently, the results concluded that soaking seed for 12 hours gave the best seed germination compared to other durations in all treatments. The highest germination rates were obtained from soaking cucumber seed in combination Mn+Fe+Zn with Zn soaking for 12 hours (100%) (Table1). Moreover, the lowest were taken from treatments DW (applied distilled water) of for 24 hours with the control were given (84.83 %) after 5 days and (87.87%) after 7 days that results show not significant different at $P<0.05$. That result is agreed with (Munzuroglu & Geckil, 2002). Also, it is contras with (Ghassemi-Golezani & Esmaeilpour, 2008) applied some salt priming on cucumber seeds. In addition, the seed germination rate agree with (Saleem, *et al.*, 2014) worked on bitter gourd. Soaking in different microelement of cucumber seeds and different time for the germination had highly affected on the seed germination, and the seed coat is not closed. For that reason, soaking seeds for some hours helps the seeds to increase the germination (Sabongari & Aliero, 2004).

According to table 2, seedling emergence percentage had non-significant different at $P<0.05$. These results agreed with (Ghassemi-Golezani & Esmaeilpour, 2008), which used the salt priming on maturity cucumber seeds.

Data present in table 3 revealed that the highest height of seedling was obtained from the treatment applied Zn for 18 hours (13.17±0.84 cm), and the lowest was given from the control (6.00±0.10cm). the result is a very significant different compared as control. (Ellis *et al.*, 1991) uses toxic effect of manure on cucumber seedling gives the same result.

Table 1: Effect of seed soaking on cucumber seeds germination.

Treatments	Time (Hours)	Germination rate (%)	
		5 days Mean±S.E.	7 days Mean±S.E.
Mn	12	96.97±3.03 Ns	96.97 ±3.03 NS
	18	87.87±8.03	93.93±6.07
	24	90.90±5.25	93.93±6.07
Zn	12	100.00±0.01	100.00±0.01
	18	90.90±5.25	90.90±5.25
	24	93.93±3.03	93.93±3.03
Fe	12	96.97±3.03	100.00±0.01
	18	90.90±5.25	93.93±3.03
	24	87.87±3.03	87.87±3.03
Mn+Zn+Fe	12	100.00±0.01	100.00±0.01
	18	96.97±3.03	93.93±6.07
	24	90.90±5.25	96.97±3.03
DW	12	96.97±3.03	96.97±3.03
	18	84.83±3.03	90.90±5.25
	24	84.83±3.03	87.87±3.03
Control	-	87.87±3.03	87.87±3.03

Means values are three replications. NS: Non significant at P< 0.05.

Table 2: Seedling emergence (%) of cucumber affected soaking seeds in some microelements.

Treatment	Time (Hours)	Seedling emergence (%) Mean±S.E.
Mn	12	24.27± 10.94 NS
	18	33.33±16.02
	24	27.30±9.10
Zn	12	33.33±13.20
	18	36.40±9.10
	24	39.40±13.19
Fe	12	57.53±3.03
	18	33.33±10.90
	24	42.40±12.10
Mn+Zn+Fe	12	42.43±28.90
	18	27.30±10.51
	24	24.27±8.03
DW	12	39.40±16.03
	18	36.37±13.87
	24	27.30±9.10
Control	-	27.30±9.10

Means values are three replications. NS: Non significant at P< 0.05

The maximum leaf area was given from treatment that applied Mn for12 hours (17.70±0.49 cm^2) and the result with significant affect comparison as control. In addition, the minimum leaf area was obtained from the control (12.73±0.39 cm^2). Also, similar results were recorded by Blanco & Folegatti (2005), and disagreed with (Yedidia *et al.*, 2001).

Stem diameter of cucumber seedling are showed no-significant different between the treatments. That result agrees with (Zhu, 2008; Ozgur, 2011).

Shoot system dry matter (gm) is given no-significant at P<0.05. The best weight of dry matter of vegetative part was obtained from the treatments that applied Fe for 12 hours (1.53±0.06 gm), and minimum weight was obtained from the treatment when soaking seed was in distilled water for 18 hours (1.26±0.02 gm). That result is agreed with (Yedidia *et al.*, 2001).

Table 3: Height of seedling (cm), leaf area (cm^2), dry matter (gm) and stem diameter (mm) affected by seed soaking in some microelements.

Treatment	Time (Hours)	Height of seedling (cm)	leaf area (cm^2)	Stem diameter (mm)	Dry matter of vegetative part (gm)
		Mean±S.E.	Mean±S.E.	Mean±S.E.	Mean±S.E.
Control	-	6.00±0.10 [a*]	12.73±0.39 [a*]	3.03±0.03 [a]	1.36±0.06 [a]
Mn	12	11.67±0.69 [b*]	17.70±0.49 [b]	3.13±0.49 [a]	1.36±0.04 [a]
	18	11.63±0.78 [b*]	17.23±0.87 [b]	3.13±0.09 [a]	1.46±0.08 [a]
	24	10.60±1.36 [a]	15.30±0.50 [a]	3.17±0.18 [a]	1.35±0.06 [a]
Zn	12	12.70±0.90 [b**]	16.70±1.22 [a]	3.17±0.03 [a]	1.41±0.08 [a]
	18	13.17±0.84 [b**]	16.13±0.77 [a]	3.13±0.15 [a]	1.36±0.03 [a]
	24	12.17±2.05 [b*]	16.93±0.32 [a]	3.37±0.22 [a]	1.46±0.08 [a]
Fe	12	11.93±0.96 [b*]	16.97±1.19 [a]	3.07±0.03 [a]	1.53±0.06 [a]
	18	11.43±1.58 [b*]	16.07±0.98 [a]	3.23±0.20 [a]	1.46±0.10 [a]
	24	12.13±0.09 [b*]	17.40±071 [b]	3.20±0.10 [a]	1.46±0.12 [a]
Mn+Zn+Fe	12	11.63±0.82 [b*]	17.63±1.21 [b]	3.17±0.18 [a]	1.43±0.09 [a]
	18	12.03±0.18 [b*]	16.60±0.60 [a]	3.35±0.23 [a]	1.47±0.12 [a]
	24	10.80±2.0 [a*]	15.50±2.28 [a]	2.87±0.03 [a]	1.35±0.04 [a]
DW	12	12.70±1.57 [b**]	16.77±1.19 [a]	3.13±0.12 [a]	1.39±0.03 [a]
	18	11.57±1.30 [b*]	17.27±1.13 [b]	3.03±0.12 [a]	1.26±0.02 [a]
	24	11.70±1.47 [b*]	15.53±0.72 [a]	2.90±0.06 [a]	1.46±0.07 [a]

[a]letter: Means treatments followed by the same letter are not significantly different at P<0.05 comparison as control.
[*] Significant different
[**] Very significant different

Conclusion

From the above mentioned results, it could be concluded that in general seed was soaking in microelements with distil water. In this study investigated increasing of seed germination parameters and seedling growth rate. Also, the duration of soaking for 12 hours had given the best effect on improving germination and seedling growth. Needing to conduct more studies with another concentration of microelements combination probably give greater effect by cucumber seed soaking.

References

1. Al-Sahaf, F.H.; I. M. Hussein. 2005. Response of the fifth leaf from the shoot apex to the spray of licorice root extract and Al-Nahrien solution in five different genotypes of cucumber. Journal of Tikrit University for Agricultural Sciences 5(1): 179-191. Arabic.
2. Blanco, F. F., & Folegatti, M. V. (2005). Estimation of leaf area for greenhouse cucumber by linear measurements under salinity and grafting. *Scientia agricola*, *62*(4), 305-309.
3. Eifediyi, E. K., & Remison, S. U. (2010). Growth and yield of cucumber (*Cucumis sativus* L.) as influenced by farmyard manure and inorganic fertilizer. *Journal of Plant Breeding and Crop Science*, *2*(7), 216-220.
4. Ells, J. E., MeSay, A. E., & Workman, S. M. (1991). Toxic effects of manure, alfalfa, and ammonia on emergence and growth of cucumber seedlings. *HortScience*, *26*(4), 380-383.
5. Ghassemi-Golezani, K., & Esmaeilpour, B. (2008). The effect of salt priming on the performance of differentially matured cucumber (Cucumis sativus) seeds. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, *36*(2), 67.
6. Hong, J., Wang, L., Sun, Y., Zhao, L., Niu, G., Tan, W., ... & Gardea-Torresdey, J. L. (2016). Foliar applied nanoscale and microscale CeO 2 and CuO alter cucumber (Cucumis sativus) fruit quality. *Science of The Total Environment*, *563*, 904-911.
7. Malepszy, S., & Niemirowicz-Szczytt, K. (1991). Sex determination in cucumber (Cucumis sativus) as a model system for molecular biology. *Plant Science*, *80*(1-2), 39-47.
8. Moreno, D. A., Vıllora, G., & Romero, L. (2003). Variations in fruit micronutrient contents associated with fertilization of cucumber with macronutrients. *Scientia horticulturae*, *97*(2), 121-127.

9. Munzuroglu, O., & Geckil, H. (2002). Effects of metals on seed germination, root elongation, and coleoptile and hypocotyl growth in Triticum aestivum and Cucumis sativus. *Archives of Environmental Contamination and Toxicology*, *43*(2), 203-213.
10. Ozgur, M. (2011). Growth control in cucumber seedlings by growth regulators application. *Bulgarian Journal Agriculture Science*, *17*, 99-106.
11. Posmyk, M. M., Bałabusta, M., Wieczorek, M., Sliwinska, E., & Janas, K. M. (2009). Melatonin applied to cucumber (Cucumis sativus L.) seeds improves germination during chilling stress. *Journal of Pineal Research*, *46*(2), 214-223.
12. Romera, F. J., & Alcántara, E. (1994). Iron-deficiency stress responses in cucumber (Cucumis sativus L.) roots (a possible role for ethylene?). *Plant Physiology*, *105*(4), 1133-1138.
13. Sabongari, S., & Aliero, B. L. (2004). Effects of soaking duration on germination and seedling growth of tomato (Lycopersicum esculentum Mill). *African Journal of Biotechnology*, *3*(1), 47-51.
14. Saleem, M. S., Sajid, M., Ahmed, Z., Ahmed, S., Ahmed, N., & Islam, M. S. U. (2014). Effect of seed soaking on seed germination and growth of bitter gourd cultivars. *IOSR Journal of Agriculture and Veterinary Science*, *6*(6), 7-11.
15. Staub, J. E., Serquen, F. C., & Mccreight, J. D. (1997). Genetic diversity in cucumber (Cucumis sativus L.): III. An evaluation of Indian germplasm. *Genetic Resources and Crop Evolution*, *44*(4), 315-326.
16. Wehner, T. C., & Guner, N. (2002, August). Growth stage, flowering pattern, yield, and harvest date prediction of four types of cucumber tested at 10 planting dates. In *XXVI International Horticultural Congress: Advances in Vegetable Breeding 637* (pp. 223-230).
17. Yedidia, I., Srivastva, A. K., Kapulnik, Y., & Chet, I. (2001). Effect of Trichoderma harzianum on microelement concentrations and increased growth of cucumber plants. *Plant and soil*, *235*(2), 235-242.
18. Zhu, J., Bie, Z., Huang, Y., & Han, X. (2008). Effect of grafting on the growth and ion concentrations of cucumber seedlings under NaCl stress. *Soil Science & Plant Nutrition*, *54*(6), 895-902.