Statistical Prediction of Mineral Constituents in Cultivated Cucumber Crops Contiguous Cement Factory

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***Abstract*— *Cement dust influence soil characteristics as well as morphological, anatomical, bio-chemical and physiological characteristics of plants. The change in morphological characteristics of plants due to cement dust pollution directly affects bio-chemical and physiological characteristics of plants, which in turn indirectly express their effect on morphological changes. Calcium content in the cucumber cultivated soil are positively correlated $0.86^{*}(A_2\text{-}A_1)$ at 0.05 level of significant, 0.98^{**} $(A_3\text{-}A_4)$ showed 0.01 level of significant; cucumber leaves are positively correlated $0.86^{*}(A_2\text{-}A_1)$ at 0.05 level of significant, 0.98^{**} $(A_3\text{-}A_4)$ showed 0.01 level of significant and cucumber fruits are positively correlated $0.90^{*}(A_2\text{-}A_1)$ at 0.05 level of significant and 0.98^{**} $(A_3\text{-}A_4)$ showed 0.01 level of significant.*

***Keywords*— Cement pollution, cucumber, mineral constituents, bio-chemical, correlation.**

I. INTRODUCTION

Cement industry plays a vital role in the imbalances of the environment produces air pollution hazards. Cement pollution became a major threat to the survival of plants in the industrial areas. Toxic compounds such as fluoride, magnesium, lead, zinc, copper, beryllium, sulphuric acid and hydrochloric acid were found to be emitted with cement manufacturing plants. Rapid industrialization and addition of the toxic substances to the environment are responsible for altering the ecosystem (Clayton, 1982). Cement dusted plants showed significant effect on the growth of plant species compared with non-cement dust plants. Lerman and Darley, (1974); Oblisami *et al*., (1978); Krishnamurthy and Rajachidambaram, (1986); Nandi *et al*., (1987); Prasad *et al*., (1991) reported that the cement exhausts dust affects developmental morphology, physical and chemical properties of the soil, plant colouration, morphology and crop productivity (Sarabai and Vivekanandan, 1992).

II. MATERIALS AND METHODS

The present investigation was done at the experimental field during summer and monsoon seasons at Thalaiyuth of Tirunelveli District. The cultivated crops around the vicinity of the factory 3-10 kilometers were considered as affected plants and beyond 10 kilometers as control plants whereas, vegetation was not found up to 1-3 kilometers from the factory due to heavy dusting of Cucumber (Variety – Poinsettie).

Estimation of Mineral Content

The mineral contents Ca, Mg, K, Mn, Al, Fe, Si, Zn, Cu and S can be determined in acid digest of plant samples and soil with the help of Flame photometer or Atomic Absorption Spectrophotometer. Flame photometer is based on the principle that atoms of metallic elements which normally remain in ground state, under flame conditions, absorb energy when subjected to radiation of specific wavelength. The absorption of radiation is proportional to the concentration of atoms of that element. The absorption of radiation by the atoms is independent of the wavelength of absorption and temperature of the flame. First apply the respective cathode lamp for the particular nutrient bring determined and then feed the blank of the working standards to the flame photometer, Feed the aliquots (plant digest containing 0.5 g plant material in 50ml volume) directly or after a required dilutions of needed. Note down the readings (and dilution factor if dilution was done) on the flame photometer. Let the reading be 'M' compare the reading of

each element with their standard curves prepared already and calculate the concentration of each nutrient element in ppm.
Weight of plant material taken = 0.5 g
Volume made after acid digestion = 50 ml
Dilution factor = 50/0.5 = 100 times

III. RESULT AND DISCUSSION

Dust particles deposited on the plant surfaces and soil forms a crust on plant and land surface. A season with more wind velocity easily flows away through high velocity wind. So the deposition of dust particles became less. **Calcium** content in the cement polluted **soil** varied from 18.10 ± 0.017 in monsoon to 20.20 ± 0.141 in summer and control soil varied from 9.90 ± 0.717 in monsoon to 10.50 ± 0.131 in summer. Calcium content in the cement polluted cucumber **leaves** varied from 5.80 ± 0.002 in monsoon to 7.50 ± 0.071 in summer and control leaves varied from 4.30 ± 0.717 in monsoon to 4.80 ± 0.051 in summer. Calcium content in the cement polluted cucumber **fruits** varied from 6.30 ± 0.071 in summer to 6.50 ± 0.032 in monsoon and control fruits varied from 3.90 ± 0.091 in summer to 5.50 ± 0.232 in monsoon. The growth metabolic processes and yield of winter barley were found to be affected by the Duna cement (Borka, 1986).

Potassium content in the cement polluted **soil** varied from 13.50 ± 0.132 in monsoon to 16.50 ± 0.002 in summer and control soil varied from 5.20 ± 0.081 in summer to 5.30 ±0.112 in monsoon. Potassium content in the cement polluted cucumber **leaves** varied from 2.90 ± 0.112 in monsoon to 6.20 ± 0.007 in summer and control leaves varied from 0.30 ± 0.008 in monsoon to 2.60 ± 0.062 in summer. Potassium content in the cement polluted cucumber **fruits** varied from 4.20 ± 0.117 in summer to 4.80 ± 0.016 in monsoon and control fruits varied from 0.14 ± 0.003 in summer to 2.90 ± 0.017 in monsoon. **Magnesium** content in the cement polluted **soil** varied from 13.20 ± 0.232 in monsoon to 15.30 ± 0.071 in summer and control soil varied from 7.20 ± 0.121 in summer to 7.40 ± 0.112 in monsoon. Magnesium content in the cement polluted cucumber **leaves** varied from 2.90 ± 0.002 in monsoon to 5.20 ± 0.005 in summer and control leaves varied from 0.80 ± 0.008 in monsoon to 1.60 ± 0.003 in summer. Magnesium content in the cement polluted cucumber **fruits** varied from 3.90 ± 0.003 in summer to 5.20 ± 0.017 in monsoon and control fruits varied from 0.50 ± 0.005 in summer to 1.90 ± 0.001 in monsoon. Lal and Ambasht, (1981) reported changes in the accumulation of mineral plant nutrients as a result of cement dust.

Manganese content in the cement polluted **soil** varied from 18.10 ± 0.018 in monsoon to 19.90 ± 0.010 in summer and control soil varied from 8.90 ± 0.009 in summer to 9.80 ± 0.010 in monsoon. Manganese content in the cement polluted cucumber **leaves** varied from 3.60 ± 0.003 in summer to 4.60 ± 0.004 in monsoon and control leaves varied from 0.80 ± 0.001 in summer to 0.90 ± 0.009 in monsoon. Manganese content in the cement polluted cucumber **fruits** varied from 3.20 ± 0.002 in monsoon to 4.80 ± 0.012 in summer and control fruits varied from 0.70 ± 0.001 in summer to 1.00 ± 0.001 in monsoon. **Aluminum** content in the cement polluted **soil** varied from 10.20 ± 0.001 in monsoon to 12.40 ± 0.012 during summer and control soil varied from 5.00 ± 0.001 in summer to 5.50 ± 0.005 in monsoon. Aluminum content in the cement polluted cucumber **leaves** varied from 4.20 ± 0.004 in monsoon to 7.40 ± 0.014 in summer and control leaves varied from 2.80 ± 0.002 in monsoon to 4.80 ± 0.004 in summer. Aluminum content in the cement polluted cucumber **fruits** varied from 5.50 ± 0.015 in summer to 6.90 ± 0.006 in monsoon and control fruits varied from 2.70 ± 0.002 in summer to 5.10 ± 0.010 in monsoon. The increased level of Calcium, potassium, Magnesium, Manganese, Aluminum, Iron, Silica, Zinc, Copper and Sulphur in the soil, leaves, stem and fruits affect the vegetative growth, metabolism and yield of vegetables (Asubiojo *et al.*, 1991; Ade- Ademilua and Umebese, 2007).

Correlation co-efficient analysis

Correlation co-efficient analysis was carried out to evaluate the inter-relationship between different variables showed both positive and negative correlation. Calcium content in the cucumber cultivated soil are positively correlated 0.86^{*}(A_2-A_1) at 0.05 level of significant whereas 0.98^{**} (A_3 - A_4) showed 0.01 level of significant; cucumber leaves are positively correlated 0.86^{*}(A_2-A_1) at 0.05 level of significant whereas 0.98^{**} (A_3 - A_4) showed 0.01 level of significant and cucumber fruits are positively correlated 0.90^{*}(A_2-A_1) at 0.05 level of significant whereas 0.98^{**} (A_3 - A_4) showed 0.01 level of significant.Potassium content in the soil are positively correlated 0.90^{*}(A_2-A_1) at 0.05 level of significant whereas 0.99^{**} (A_3-A_4) showed 0.01 level of significant; cucumber leaves are positively correlated 0.85^{*}(A_2-A_1) at 0.05 level of significant whereas 0.97^{**} (A_3 - A_4) showed 0.01 level of significant and cucumber fruits are positively correlated 0.85^{*}(A_2-A_1) at 0.05 level of significant whereas 0.97^{**} (A_3 - A_4) showed 0.01 level of significant. Magnesium content in the soil are positively correlated 0.99^{**} (A_2-A_1) and (A_3 - A_4) at 0.01 level of significant; cucumber leaves are positively correlated 0.97^{**} (A_2-A_1) and (A_3 - A_4) at 0.01 level of significant and cucumber fruits are positively correlated 0.97^{**} (A_2-A_1) and (A_3 - A_4) at 0.01 level of significant.Manganese content in the soil are positively correlated 0.98^{**} (A_2-A_1) & 0.97^{**} (A_3-A_4) at 0.01 level of significant; cucumber leaves are positively correlated 0.96^{**} (A_2-A_1) and 0.97^{**} (A_3-A_4) at 0.01 level of significant and cucumber fruits are positively correlated 0.96^{**} (A_2-A_1) and 0.99^{**} (A_3-A_4) at 0.01 level of significant.Aluminum content in the soil revealed no correlation during summer and monsoon in cement polluted and control plants; leaves revealed no correlation during summer and monsoon in cement polluted and control plants and fruits revealed no correlation during summer and monsoon in cement polluted and control plants.

IV. CONCLUSION

The statistical prediction of mineral constituents and correlation regarding the studies on the effect of cement pollution revealed that the cultivated crops seriously core reduction in yield, marketable value and quality.

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