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We Examined about Soil and Agrochemical Factors on Tomatoes Planting in the Mount Area

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Abstract: Ta Ngao is the local name in Loc Thanh Village, Bao Lam District, Lam Dong Province. This district is a place that has rich mineral resources in the province with 10% in the total mineral resource value of Southeast. With a waterfall of 7 stages, it seems to be one beautiful site, a big resource for hydroelectricity generation. Besides, there are some natural landscapes and human resource for many forms; this is a conversing place of many peoples; therefore, we have a strong potential to develop the tourism. It is a wild area, everyone plants a little; therefore, here, it has not vegetables. The soil and the efficiency of the trees do not care. Here, we examined the heavy metals on the tomatoes and we studied fertilizers, and we want to improve the soil, to serve the product for the people better.

Key words: Fertilizer, tomato, heavy metal, soil, area.

1. Introduction—A Cause of Research

Tomato: Scientific name: Lycopersicon esculentum (L) Mill; Family: Solanaceae.

Tomatoes are the nutrient foods, useful for the health and used as vegetables in the meal of men [1, 2]. Tomato contains: Protein, lipid, glucose, a lot of lycopene, Vitamins A, C, B_1, B_2, B_6, E, K, organic acid: malic, citric, minerals (potassium, calcium), antioxidants and polyphenols such as: Chlorogenic acid, ferulic acid; tomato is rich in nutrients: fresh, slake, but it contains very low calorie. However, the green fruits contain the toxic compounds such as: tomatine, solanine…So, we do not eat the raw [3-6].

During the process of cultivating tomatoes, using unsafe soil and irrigation water (for example, containing heavy metals) can lead to reduce quality of post-harvest products. One of the reasons makes unsafe products can be contaminated heavy metals. This is harmful to human health. The heavy metals such as Copper (Cu), Cadmium (Cd), Plumb (Pb), Zinc (Zn)... can be found in cultivating soil, fertilizers and chemical pesticides.

The harmful effects of some heavy metals can be described as follows:

Toxin of Arsenic (As): When the amount of Arsenic exceeds the allowable limit, it will affect health including kidney, liver, and lung cancer. In addition, it also causes heart diseases such as hypertension…

Toxin of Cadmium (Cd): For humans, Cd is harmful because it can destroy the kidneys. Cd is often contaminated through food and drinking water. When Cd penetrates human organs, it can cause bone fractures or cancer.

Toxin of Copper (Cu): Water containing high copper level or copper water pipes can cause copper contamination in humans or due to eating vegetables and fruits containing high copper content or using algaecides in the lake… Copper content of 1 g/1 kg body weight can kill humans and the copper content of 60 to 100 mg/1 kg body weight can vomit if it is short or superabundance.

Toxin of Plumb (Pb): Pb can enter the human body through the respiratory tract, skin and through the digestive process. If it stays in cells for a long time, it becomes very harmful, affecting serious health: headaches, spasms,

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convulsions, fainting, leading to organ damage or death.

Toxin of Zinc (Zn): Zn is the necessary nutrient but when there is an excess of Zn, the cells will be poisoned in the short time. When there is short of Zn, human can have diseases involving reproduction, liver, shin and others illnesses. Zn can also provoke cancer, and cause toxicity to the nervous system and system of immunity [7-9].

In this report, we take care to use the organic fertilizer instead chemical fertilizer. We analyzed the heavy metals contain in tomatoes, to evaluate the effectiveness of organic growing method. The goal of this study is to find a safe growing method for obtaining quality products, safe for environment and low price. Tomatoes are not only eaten but also cure the diseases.

2. Materials and Methods

2.1 Materials

+ Seeds of tomatoes were taken in the households of farmers, surrounding experimental aera.

+ The experiment was implemented in Loc Thanh Village, Bao Lam District, Lam Dong Province [10]. Time: Total the months of year 2023.

2.2 Methods

Tomatoes were planted by using only organic fertilizers, such as: soil herbs, animal fertilizer, powder lime, ash of husk, biological fertilizer.

Plantation: Every year, the seeds were sowed since November, December, harvesting in January, February; if everyone plants in January, February, he will harvest in March, April. Seeds were selected carefully, soak in warm water (#40 °C) about ten minutes, and were taken and gotten in the manure; he waters them in the morning and afternoon. Here, there are animals: worms, rats… Everyone planted tomatoes in the field; he waters two times for a week in the rainy season and waters every day in the sunny season.

3. Results and Discusions

3.1 The Common Diseases at the Tomato Trees

The phenomena of sudden death of the tree; the phenomena of the dry leaves; the phenomena of buds and flowers fall off; the disease of curly top; the disease of Powdery mildew Fusarium wilt, Bacterial… [11-15].

3.2 Analyzing Indicators in Cultivating Soil and Water Samples

The Table 1 was showed that pH of soil was low; total N, P, K and Mg^{2+} were very low. However, Al^{3+} was high; Ca^{2+}, Mg^{2}: low; SO_4^{2-}: high. The clay and flesh were high; brief, the cultivating soil sample was poor in nutrients so it is necessary to supplement nutrient, especially, organic nutrients.

Table 1 Parameters of cultivating soil sample.

No.	Parameters		Concentrations	Methods	Limitation values*
1	pH (H_2O) 1:5		5.77	Standard of VN 5979-155	6.5-8.5
2	pH (KCl) 1:5		4.35		6.0
3	EC (μS/cm)		7.10	Standard of VN 6650-2000	10-20
4	N total (%)		0.065		0.1-0.15
5	P total (%)		0.016	Standard of VN 6440-2000	0.06-0.08
6	K total (%)		0.015		0.3-1.5
7	Al^{3+} exchange (mg/100 g)		3.16	AOAC 990.08-2000	0.1
8	Ca^{2+} (mg/100 g)		0.098	Standard of VN 6496-1999	4.0-6.0
9	Mg^{2+} (mg/100 g)		0.079		2.0-3.0
		Sand (%)	12.6		
10	Emery	Clay (%)	32.8	AOAC 2000	-
		Flesh (%)	54.6		
11	SO_4^2 (mg/100 g)		2.24	Standard of VN 6656-2000	1.0-2.0

*According to Vietnam standard/national technical regulation on the limits of heavy metals (Vietnam Technical Regulation 8-2: 2011/Medicinal Ministry) [16].

Table 2 Parameters of water sample.

No.	Parameters	Concentrations	Methods	Limitation values*
1	Cu (mg/l)	-	ACIAR-AAS 015-2007	0.03
2	Pb (mg/l)	-	ACIAR-AAS 015-2007	0.01
3	Cd (mg/l)	0.4	ACIAR-AAS 004-2007	0.02
4	As (mg/l)	0.3	ACIAR-AAS 001-2007	0.2
5	Zn (mg/l)	1.15	ACIAR-AAS 019-2007	0.01
6	Fe (mg/l)	0.12	Standard of VN 6177-1996	0.5
7	Al^{3+} (mg/l)	1.0	ISO 12020-1997	0.5
8	Color (Pt/Co)	9.0	Standard of VN 6158-1996	1.0
9	pH H_2O	7.10	Standard of VN 6492-2000	6.5-8.5
10	Degree of muddy, dirty (NTU)	8.0	Standard of VN 6158-1996	2.0
11	Cl^- (mg/l)	2.88	Standard of VN 6194-1996	250
12	PO_4^{3-}	2.24	Standard of VN 6178-1996	0.1
13	SO_4^{2-}	1.37	Standard of VN 6200-1996	0.5
14	$N\text{-}NO^{2-}$ (mg/l)	-	Standard of VN 6178-1996	0.05
15	$N\text{-}NO^{3-}$ (mg/l)	-	Standard of VN 6180-1996	0.05
16	$N\text{-}NH^{4+}$ (mg/l)	0.02	Standard of VN 5988-1995	0.3
17	Coliform (MPN/1,000 l)	< 0.03	Standard of VN 4882-2001	≤ 1,000
18	E. Coli (MPM/1,000 l)	< 1.0	Standard of VN 6846-2001	20

*According to Vietnam standard/national technical regulation on the limits of heavy metals (Vietnam Technical Regulation 8-2: 2011/Medicinal Ministry) [16].

In the Table 2, pH value was average; the degree of color was high; the heavy metals such as Cu, P: No appear; Cd, As, Zn: were over limit; Fe: low; Al^{3+}: high; SO_4^{2-}: high, PO_4^{3-}: low, NO^{2-}, NO^{3-}: No appear; Cl^-, NH^{4+}: were low; Coliform and E. Coli were low.

3.3 Analyzing Indicators in Tomatoes Sample

The Table 3 exhibited that: NO_3^-, Pb, Cd: are low comparing with a limit; wet degree: average; lipid, protein, glucose, Cu, Zn. As: are high, comparing with a limit.

Table 3 Parameters of tomatoes.

No.	Parameters	Concentrations	Methods	Limitation values*
(1)	(2)	(3)	(4)	(5)
1	NO_3^- (mg/kg)	147	AOAC & TC 2000	400
2	Wet degree (%)	88	10TCN 302-97	80-90
3	Lipid (%)	0.66	AOAC 87.01-1997	0.5
4	Protein (%)	1.56	AOAC 987.04-1997	0.5
5	Glucose total (%)	3.80	AOAC 974.06-1990	1.0
6	Substance of filament (%)	1.47	AOAC 973.18C-1990	-
7	Pb (mg/kg)	0.01	ACIAR-AAS.015-2000	0.02
8	Cu (mg/kg)	2.20	ACIAR-AAS.007-2007	0.1
9	Zn (mg/kg)	13.40	ACIAR-AAS.019-2008	0.5
10	Cd (mg/kg)	0.01	ACIAR-AAS.004-2007	0.017
11	As (μg/kg)	0.20	ACIAR-AAS.001-2007	0.015

*According to Vietnam standard/national technical regulation on the limits of heavy metals (Vietnam Technical Regulation 8-2: 2011/Medicinal Ministry) [16].

4. Conclusion

Soil samples, irrigation water and tomatoes samples grown by households in Loc Thanh Village, Bao Lam District, Lam Dong Province, were analyzed. These samples contained some metal content such as: Zn, Pb, and As... higher than the allowable limit. And SO_4^{2-}, Al^{3+}: high; total of N, P, K, Mg^{2+}: are low, the soil is poor; it needs neutron, and adds the organic fertilizer. Example: wild herbs, animal fertilizer, powder lime, ash of husk, biological fertilizer. The farmers can plant tomatoes trees to sell in order to have moneys [17]. Tomatoes trees can live everywhere and all types of weather [7, 18]. Tomatoes are nutrients, and are foods for the poor men [19].

Everyone went to have a high productivity, many tomatoes to be fostering a health for the men; he must to take care an environmental factor, soil and agrochemical factors [20]. The clean vegetables must have not the heavy metals, worms, diseases [21]. And for some diseases of tomatoes, we must to take care: Cultivating must be according to suitable time frame; tomatoes variety selection; applying fertilizer carefully to tomatoes; having methods for disease prevention.

Abbreviations

H_2O: water; Ca: Calcium; P: Phosphor; K: Kalium; Fe: Ferrum; S: Sulfur; Mg: Magnesium; Na: Sodium; Cu: Copper; Cd: Cadmium; As: Arsen; Pb: Lead; Zn: Zinc.

Benefit Conflict

We declare no conflict of interest.

Contribution of the Author

An Nguyen Thi Ngoc: The author observed, investigated, searched everywhere about the trees, controlled the experiments, studied, wrote and prepared, presented a report.

Trang Huynh Nguyen Thuy: investigated, observed on the households, collect data.

References

[1] Agriculture Board and National Research Council. 1968. *Effect Pesticide on Fruit and Vegetable Physiology*, 5.

[2] Environmental Department. 1995. *International Conventions on Environmental Protection*. Hanoi: National Politics Publishing, 10-12.

[3] An, N. T. N. 1986. *Ecosystem of the Home-Garden*. Ho Chi Minh City: Agricultural Publishing, 17-19.

[4] An, N. T. N. 1996. *The Necessaries Trees on Garden in the South of Vietnam*. Ho Chi Minh City: Agricultural Publishing, 12 - 15.

[5] Ho P. H. 1991-1993. *Vietnam Medicinal Trees*. Montreal: Montreal Publishing, 104, 158.

[6] Ho, P. H. 2006. *The Trees of Vietnam Country*. Montreal: Montreal Publishing, 72.

[7] Kerry, T. R., Pearce, D., and Bateman, I. 1995. *Environmental Economics*. Ho Chi Minh City: University of Agriculture and Forestry, 40-43.

[8] Thi, T. K., and Hung, T. N. 2002. *The Technique to Plant the Clean Vegetables*. Ho Chi Minh City: Agricultural Publishing, 8-10.

[9] Tam, P. T. M. 2007. *A Study to Effluence When Everyone Uses the Area Fertilizer to an Output and a Change of a Nitrate Quality in the Pe-tsai*. Ho Chi Minh City: Agricultural Publishing, 31-32.

[10] Bao Lam District. 2015. *Document about a Report of Bao Lam District, Lam Dong Province*, 5-9.

[11] An, N. T. N. 2004. *Environmental Study of the Green Vegetable Garden in Ho Chi Minh City*. Report was examined by the subject at department level, 15, 20.

[12] An, N. T. N. 2010. *The Trees to Cure the Diseases and an Environment.* Ho Chi Minh City: Agricultural Publishing, 30-32.

[13] An, N. T. N. 2022. *The Rural and Agricultural Environmental Management.* ISBN:987-604-60-3573-2. Ho Chi Minh City: Agricultural Publishing, 10-14.

[14] Hoa, L. T. N., and An, N. T. N. 1996. *A Production of Vegetables in Hoc Mon District*. Ho Chi Minh City: Agricultural Publishing, 26-30.

[15] Minh, T. 1996. *Technology of the Plant Fruits or Vegetables.* Ca Mau: Publishing of Ca Mau, 10-17.

[16] Medicinal Ministry. 2011. *National Technical Regulation on the Limits of Metals Contamination in Food*, 4-8.

[17] Juha, I. U., and Godt, M. C. 1993. *Environmentally Sound Socio-Economic Development in the Humic Tropics.* Jingumae: The United Nations University, 30-32.

[18] Lee, S. L. 1984. *From Garden to Kitchen: Grow Your Own Fruit and Vegetables*. Ho Chi Minh City: Agricultural Publishing, 18.

[19] UNDP. 1992. *Report about the Development of Men*. Oxford: Oxford University Press, 28-29.
[20] Xuan, V. T. 1984. *Soil and Plants*. Hanoi: Vietnam Education Publishing House, 30-31.
[21] Uyen, N. V. 1995. *Garden of Clean Vegetables*. Ho Chi Minh City: Agricultural Publishing, 8-9.

Appendix

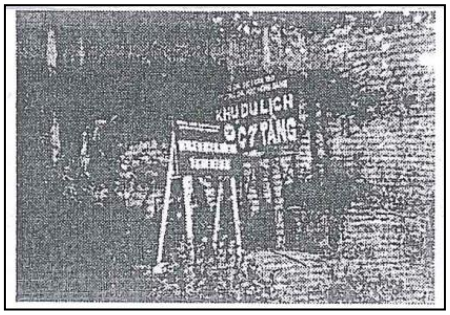

Fig. 1 This is a place of planting vegetables.

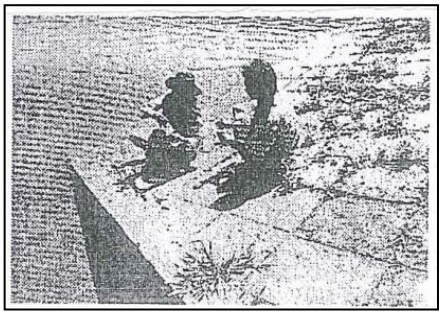

Fig. 2 We took water to analyze.

Fig. 3 Worms.

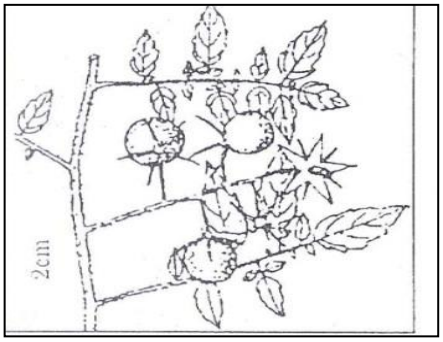

Fig. 4 Tomatoes.