Harmful effects of fluorine compounds on agricultural crops

Ilhom Samatov[1*], *Javokhir* Umirov[1], *Khasan* Akhmedov[1] , and *Zafar* Narboyev[1]

[1]Tashkent State Agrarian University, Department of Ecology and Botany, 100140 Tashkent, Uzbekistan

Abstract. Environmental problems such as environmental changes, soil, water and atmospheric air pollution and depletion of biological resources are observed in the world as a result of economic and technical development of countries, growth of production rate, population growth. In particular, as a result of the increase of industrial waste, its negative impact on atmospheric air pollution, the amount of CO_2, N_2O, CH_4 gases and fluorine compounds in the biosphere is increasing year by year. The abundance of fluorine compounds in agricultural products leads to a decrease in the quality of products. The obtained results revealed that trees such as quince, vine, peach, apricot have a high degree of drying from the edges of the leaves compared to the control.

1 Introduction

Global changes in the atmosphere as a result of areas with production centers in different regions of the world, emissions from factories and factories, nuclear and hydroelectric power plants, machinery, metallurgy, production of construction materials and development of urban planning, as well as transportation of many large-scale daily goods, most of agriculture soil fertility, environmental change and a decrease in the yield of various agricultural crops were determined in the branches. The negative consequences of atmospheric air pollution by toxic gases, especially its impact on the growth, development and productivity of agricultural crops, have been scientifically proven. It is known that hydrogen fluoride gas actively reacts with magnesium, manganese, copper, iron, cobalt, calcium, iodine and other metals to form compounds such as calcium fluoride, potassium fluoride, sodium fluoride. It should also be said that while sodium fluoride is a very toxic compound, calcium fluoride compound has poor permeability in the cell membrane and has a negative effect on the structural structure of cells and tissues [1-5].

Fluorine compounds are the third most pollutant of the environment after sulfur dioxide (SO_2), carbon dioxide (CO_2). Fluoride forms a poorly soluble solution with some substances. For example, SaF2, as we know, Ca plays an important role in forming the functional structure of living organisms. Because fluorine is a strong oxidizing agent in the environment and in living organisms, it displaces oxygen. The element known as fluorine is

* Corresponding author: ilhomsamatov22@gmail.com

widely distributed in nature and is found in soil, sea water and bones of living organisms. [21, 22].

Fluoride compounds are about 0.25 mg/l in natural water. River waters of different regions, for example, 0.10-0.30 mg/l in the Irtish River, 0.30-0.40 mg/l in the Syrdarya. In general, the amount of REM of fluorine compounds in water should be 1.5 mg/l (in the water consumed by humans, it is 1.0 - 1.5 mg/l) [16-22].

It should be noted that fluorine is 0.05% in normal soil, 0.78% in saline soil, and up to 1.24% in alkaline soil. The percentage of fluorine is 0.05% in normal soil, 0.78% in saline soil, and 1.24% in alkaline soil (Gopanyuk 1983). Prof. Tajikistan Aluminum Company State Unitary Enterprise (TALKO DUK) has spread fluorine compounds into the environment, several times higher than the norm in human consumption products. T.I. Iskandarov made it clear in his investigations conducted many years ago [23-31].

2 Materials and Methods

The abundance of fluorine compounds in agricultural products leads to a decrease in the quality of products. The amount of vitamins necessary for humans in agricultural products is not recorded in available scientific sources. In the given data, it can be seen that the amount of fluorine compounds in food products consumed by humans is higher than the established norm on March 15-20.

Table 1. Amount of fluorine compounds in food products, water and soil, mg/kg

№	Food products	Sariosia district	Jarkurgan (control) district
1	Milk	37,2	0,74
2	Yogurt	32,4	1,7
3	Wheat	13,7	2,1
4	Peas	57,4	2,6
5	Onion	37,2	0,75
6	Potatoes	52,6	3,72
7	Carrot	55,7	2,2
8	Pomegranate	20,7	1,75
9	Soil	72,7	2,7
10	Running water	0,74	0,67

Therefore, during the research, it was aimed to determine the amount of vitamins in the content of the toxic gases emitted from TALKO DUK, hydrogen fluoride compounds, apples, peaches, apricots, tomatoes and other fruits of agricultural plants.

TALKO DUK annually emits about 22,000 tons of toxic substances into the atmosphere, including 120 tons of hydrogen fluoride, which is considered extremely dangerous and harmful to human health and the environment. However, the impact of 1 ton of hydrogen fluoride on people and the environment is more dangerous than 1000 tons of carbon dioxide.

Most of these wastes reach the northern districts of Surkhandarya region, where more than 1.5 million people live, with the wind. The inhabitants of these districts

During 18-19 hours, they are forced to breathe atmospheric air containing hydrogen fluoride and other compounds dangerous to human health, coming out of chimneys of production facilities with a high level of environmental pollution, which do not meet environmental standards.

The leaves of apricot (*Armeniasa vulgarus* Lam), vine (*Vitis vinifera*), and tomato (*Lysopersison essulentum*) growing in Denov, Sariosia, Uzun, Jarkurgan districts were

collected as research objects. The amount of endogenous protective substances and elements in the plant leaf was determined in laboratory conditions.

5-10 g is taken from the crushed samples. The obtained sample was placed in a 300 mg flask with a flat bottom and 50 mg of 40% ethanol solution was added to it. The mixture was heated under constant stirring for 1 h using a magnetic stirrer and reflux condenser. It was then stirred at room temperature for 2 hours. After cooling, the mixture was filtered. To the residue was added 25 mg of 40% ethanol and filtered (this process involved 2 extractions). The resulting filtrate was placed in a 100 ml volumetric flask and 40% ethanol (5-10%) was added up to the measurement line (100 ml). The resulting solution was centrifuged at 7000 rpm for 10 minutes. The resulting solution was taken from the top for analysis.

Working solutions of water-soluble vitamins were prepared at a concentration of 1 mg/ml. For this, 50.0 specific mass was taken from each vitamin standard on an analytical balance and 40% ethanol was added to the measurement line (50 ml) in a 50 ml volumetric flask.

In scientific sources, it is recommended to use phosphorus, acetate buffer systems and acetonitrile as an eluent for the determination of water-soluble vitamins using the YuSSX method. Our assays were performed using acetonitrile with an acetate buffer system.

Chromatography conditions:

- chromatograph Agilent-1200 (equipped with an autodoser);
- column Exlipse XDB S18 (obrashenno-faznyy), 5 μm, 4.6x150 mm;
- diode-matrix detector (DAD). Detectable at 204 nm, 245 nm, 254 nm, 290 nm
- flow rate 1 mg/minute
- eluent acetate buffer: acetonitrile: 96:4 for 0-5 minutes;
  6-8 minutes 90-10;
  9-15 minutes 80-20;
  15-17 minutes 96:4.
- thermostat temperature 250C
- 5 μl injected amount (vkol)

First working standard solutions were introduced into the chromatograph, and then the prepared working solutions were introduced. Each assay was repeated at least 3 times.

Using the chromatography method, the amount of rutin substance Rf = 0.65 and flavonoid substance Rf = 0.75 was isolated by thin layer chromatography method. The obtained substances were stored in a refrigerator with a bag. Then the amount of these substances was measured by the method of polarography. It was found that the obtained results increased up to 1.5-2 times in peaches, apricots, vines, and the amount of rutin decreased compared to the control district of Jarkurgan. It was found that the amount of flavonoids decreased by 1.5-1.6 times in the leaves of the studied plants. The results of testing the amount of bioflavonoids in the fruit of plants revealed that the amount of vitamins and flavonoids in the fruit of the plant is higher than that of the leaf of the plant in the control district itself.

3 Results and Discussion

Leaf of the vine (*Vitis vinifera*) growing in Dashnobad village of Sariosia district (a), cherry (*Carasus avium* L.) Spring variety leaf (b) and apricot (*Armeniasa vulgarus* Lam.) apple (*Malus domestica* Borkh.) Renet Semerenko variety leaf (d), samples of tomato (*Solanum lycopersicum*) Surkhon-142 variety leaves (e) infected with fluorine compounds (see Table 2).

Table 2. The amount of free amino acids in the leaves of some fruit trees in the northern districts of Surkhandarya region, mg/g

Names of amino acids	Sariosia district			Jarkurgan (control) district		
	Vitis vinifera	*Carasus avium*	*Armeniaca vulgarus*	*Vitis vinifera*	*Carasus avium*	*Armeniaca vulgarus*
Aspartic acid	0,13671±	0,037037±	0,118464±	0,118464±	0,14488±	0,22658±
Glutamic acid	1,025493±	0,05551±	0,141036±	0,078536±	0,115543±	0,258224±
Cool	0,922173±	0,534998±	1,028634±	0,171072±	0,386686±	0,397699±
Glycine	1,949144±	4,822243±	1,093869±	0,4173±	8,153992±	3,042776±
Asparagine	1,948243±	4,809117±	1,095679±	0,418566±	8,149573±	3,037274±
Glutamine	1,134928±	0,485645±	0,425359±	1,462201±	1,438756±	1,051196±
Cysteine	0,645597±	0,808901±	0,513089±	0±	0,560209±	0,730366±
Threonine	0,396291±	0,275738±	0,319076±	0,132256±	0,154996±	0,099357±
Arginine	0,578837±	0,847826±	0,694866±	0,288109±	1,41802±	0,127816±
Alanine	0,493056±	0,999592±	1,001838±	0,456495±	1,516748±	0,467729±
Proline	0,849781±	0,815428±	2,781074±	11,52467±	3,115553±	1,179888±
Tyrosine	0,710997±	0,570759±	0,326087±	1,055413±	0,583546±	0,14578±
Valin	2,133144±	0,549897±	0,672958±	0,255171±	1,257239±	0,158997±
Methionine	0,269611±	0,416254±	0,059717±	0,204974±	0,328622±	0,304947±
Isolate	1,379401±	0,165918±	0,9±	0,115356±	0,128839±	0,082397±
Leucine	0,426875±	0,200756±	0,8381±	0,208851±	0,259579±	0,248786±
Histidine	0,776347±	0,358314±	0±	0,514052±	0,288056±	0,173302±
Tryptophan	0,745697±	0,745688±	1,3544006±	1,935608±	1,627003±	0,264688±
Phenylalanine	0,575901±	0,119949±	0,808518±	0,541318±	0,322534±	0,087914±
Lysine NSI	0,071811±	0,016315±	0,069938±	0,023536±	0,127574±	0,063252±
Total	17,17104±	17,63678±	14,43049±	19,92195±	30,07795±	12,14897±

In the area of influence of the enterprise, even at the minimal level of pollution, it was found that the metabolism of minerals and proteins in plants was severely disturbed. This leads to a decrease in yield and fruit quality. During the laboratory experiments, it was proved that some bio stimulants involved in the management of mineral and protein metabolism in plant seeds can be reduced to change (react) under the influence of chemical compounds.

4 Conclusion

At the end of field observations, it was found that the spread of fluorine compounds decreased the productivity of plants around a distance of 20-30 km, and the number of dried tree trunks was high. The main symptoms of damage are chlorosis and necrosis in young plant leaf cells. In addition, fluorine compounds reduce the intensity of phytoncide release in plants and reduce the resistance of affected trees to el xylophages. Accumulation of toxic substances on the cell surface or inside cells due to gaseous dust containing fluorine compounds is the most dangerous. High levels of fluoride in plants are very harmful to animals that consume it, especially ungulates. Also, the amount of fluorine compounds released by TALKO DUK into the environment is increasing year by year in soil, water and plant composition, causing other serious environmental problems.

During the ecogeobotanical expeditions carried out in the area under the influence of TALKO DUK, the impact of external environmental factors on the populations of apricot, vine, and cherry plants spread in this area was observed. As a result of the observations,

although the last months of the spring season are April and May, severe damage to the young cells of the tree leaf edge was observed in the existing plant populations.

As can be seen from the above information, fluoridated waste not only reduces the growth, development and productivity of plants, but also the consumption of agricultural and natural plants has a negative impact on the animal and human body, causing metabolic disorders and various diseases.

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