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Original Research Article

Effect of the Fumes Emitted From Refinery of Haditha City on the Leaves of Abelmoschus Esculentus L. Planted East of the City

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Abstract: The effect of fumes from a refinery on the leaves of some plants cultivated in the east of hadith (where the direction of the refinery fumes) was studied, which is a guide to determine the effect of pollutants on living organisms. Some anatomical changes of okra leaves such as length and width (epidermal cells, stomata cells, stomata pores) and the percentage of chlorophyll in plant leaves have been studied.

The results showed a clear decrease in the length of the epidermal cells until it reached the lowest length in the cells of plants grown in the Alos region, where the rate of decrease was 35 micrometers. The width of the leaf cells grown in that region was 18 micrometers, and the decrease in the average size of the epidermal cells led to a decrease in the size of the stomata cells as well. The average width was 3.9 micrometers compared to the comparison plant, as was the case for the size of the stomata pores and the percentage of chlorophyll. The results showed that cultivation in the areas near the source of the fumes increased the decrease in the average size of the stomata pores, the highest decrease was in the Alos area, which amounted to 5.9 micrometers. As for chlorophyll, it increased. The study showed a clear increase in the amount of decrease in its percentage by approaching the source of fumes until it reached approximately 50.2 and this decrease in the percentage of chlorophyll leads as a result to a reduction in plant growth as a result of Decreased photosynthesis.

Keywords: Pollution, filters, fumes, leaf cells, okra

INTRODUCTION

The problem of air pollution has become one of the most prominent problems faced by humans at the present time, and air pollution is considered the worst type of pollution, as the annual losses of this pollution are estimated at about 50 million dollars annually [1]. We find that industrial cities all over the world are among the areas most exposed to the phenomenon of pollution, in addition to developing countries that do not have the capabilities to reduce environmental pollution. The European Council defined air pollution as follows: “Air pollution is caused when a foreign substance is present in it or when a significant change occurs in the proportions of its constituent substances, which leads to harmful consequences, and causes inconvenience and disturbance.” The sources of air pollution are divided into two parts: natural sources, such as: gases and dust resulting from volcanoes, forest fires, and dust resulting from storms, and these sources are usually limited in certain areas governed by the geographical and geological factor. On the surface of the earth, the use of fuel in industry, transportation, electricity generation and other activities leads to the emission of various gases and fine particles to the air, the most important of which are: carbon dioxide, carbon monoxide and sulfur compounds (sulfur dioxide, nitrogen oxide). This type of pollution is constantly continuing human activities and spreading on the surface of the earth in population centers, and it is the pollution that raises interest and concern, as its components and quantities have become varied and large to a degree that caused a noticeable imbalance in the natural composition of the air [2].

Iraqi refineries suffer from old and extinction and the abundance of combustion gases, hydrocarbons and volatile organic compounds. In addition to the low combustion efficiency inside its units and steam generating boilers, in addition to what is released by the gases burning in them. Also, there are no systems in most Iraqi refineries to treat emission of gaseous emissions or suspended particles.

The Iraqi refineries were not able to produce clean fuels according to international standards for the environment, and one sees the flames emitted from the towers of those refineries as they emit gray smoke and sometimes it is formed in a blackish color. The gasoline and diesel produced in Iraqi refineries have many impurities and are not suitable for the environment, as it is a dangerous pollutant [3].

One of the most important of these Iraqi refineries is the Haditha refinery, which is the focus of our study. The Haditha refinery is one of the northern oil refineries in Iraq, and it is a consultant refinery in the Anbar Governorate / Haditha. The capacity of 70 thousand barrels / day, and the implementation of the refinery will be in the manner of BooT or Boo in accordance with the Refineries Investment Law No. 64 of 2007 and its amendments. Air pollutants can be divided into six main groups as follows: (carbon oxides (Cox), nitrogen oxides (NOx), sulfur oxides sox)), sulfur dioxide SO2 and sulfur trioxide S03, volatile organic matter Volatile Organic Compounds, chemical and oxidizing substances formed from the gaseous envelope during the reaction of oxygen, nitrogen oxide and volatile organic substances under the influence of solar radiation, Particulates Matter [4] [5] [6].

MATERIALS AND METHODS

Geographical location

Haditha Refinery is located in western Iraq, about 130 km west of Ramadi, the center of Anbar Governorate. Samples of okra plants were taken from three areas located east of the refinery, because the wind direction is usually from the west direction, which pushes the vapors rising from the refinery towards the east. The first area from which samples were taken is the Alos area, which is located about 10 km east of the refinery. The second sample was taken from the Jubbah area, which is about 30 km east of the refinery, while the third sample was taken from the Dulab area, which is about 50 km away. km east of the refinery. The leaves of the plant were taken for tests and measurements, while the percentage of chlorophyll in the plant was measured locally, as will be explained in another paragraph.

How to use the Spad device to measure the percentage of chlorophyll:

The percentage of chlorophyll is measured at sunrise or before sunset using the Spad device in the field provided that it is not exposed to sunlight. The process is carried out by taking measurements for a group of plant leaves from three areas (the top of the plant, the middle and the bottom of the plant) and then taking the average of the percentage of chlorophyll in plant [7].

Preparation of the epidermis

The epidermis was prepared from the leaves of fresh samples of the okra plant (Abelmoschus esculentus L.) and followed the method [8], with some modifications, as follows: A part of a whole sheet of paper was taken from a fixed place (the middle of the paper is close to the middle vein and part of the blade and the edge. Both methods were used peeling and stripping off to obtain the upper and lower skins, using a slicing blade and forceps with two ends for two minutes, then brushed on a glass slide (slide) placed On it a drop of glycerin was then covered with a slide cover and then it was ready for examination and study. (5) samples for each type were studied and measurements of stomata, dimensions of epidermal cells and their shapes were taken under the compound microscope type (ALTAY) and using the ocular micrometer in the study of stomata complexes Under the 40x power of the genera of the family under study, the skins were photographed with the digital camera on the compound microscope.

RESULTS AND DISCUSSION

Upper epidermal cells of leaves:

The data on the surface view of the leaf epidermis are listed in Table (1) that the epidermal cells of the leaves of the plant under study decreased in size as the proximity to the source of fumes increased, which is a refinery of Haditha, compared to the epidermal cells taken from a plant very far from the source of fumes, and the results appeared as shown In Table (1), the average length of epidermal cells in the Alus region, the region closest to the source of the fumes under study, was (56.25 µm), which decreased by about (35 µm) compared to the epidermal cells of the comparison sample, where the average length of epidermal cells was (91.25 µm) in While the average length of epidermal cells in Jubbah and Dulab regions, which is farthest from the source of the fumes, were (68 and 78.75 µm), respectively, where the decrease in the average length of cells decreased the farther away from the source of the fumes was (23.25 and 12.5 µm), respectively. Compared to the comparison treatment, and this was also evident on the width of the epidermal cells, where the decrease in the width of the cell decreased the farther away from the source of the fumes, where the cells recorded the lowest width in the wheel area reached (55.25 µm), where the average width decreased by (1.25 µm) from the average width of the epidermal cells of a plant maq While it gave the highest decrease in the average width of Aloqa cells in the Alos region closest to the source of fumes, it amounted to (18 µm) compared to the cells of the control plant, while the decrease was between the lowest and the highest decrease in the Jubbah area, this decrease reached (6.25 µm) compared to the control plant and so it was The size of the epidermal cells decreased the closer to the source of the fumes. This result agrees with [9] [10] as they confirmed in their studies that air pollution resulting from the fumes of factories, laboratories and refineries led to a decrease in the size of the epidermal cells in the leaves of the plants, and thus a decrease in the size of the leaves in general, and this may be due to To coagulation of colloidal substances in the cytoplasm and obstruction of the synthesis of nucleic acids in the growth centers as well as disruption of the process of photosynthesis as indicated by [11].

Stomata guard cells (stomata cells):

The results in Table (1) showed that the stomata cells in the leaves of the plant under study had decreased in size, as the average length of stomata cells in the Alus region, the region closest to the source of the fumes under study, was (20.3 µm), which decreased by (6.4 µm) compared to the stomata cells. For the comparison sample, the average length of stomata cells in them was (26.7 µm), while the average length of stomata cells in the Jubbah and Dulab regions, which are farthest from the source of fumes, respectively was (23.8 and 24 µm), respectively, where the decrease in the average length of cells decreased as we moved away Regarding the source of the fumes, the decrease was (2.9 and 2.7 µm), respectively, compared to the control treatment, and this result was mostly the result of the decrease in the length of the epidermal cells in general and stomata cells included, as for the width of the stomata cells, the decrease in the width of the cell increased as we approached From the source of the fumes, where the results in the same table showed that the lowest width of the guard cells was in the Alos region, which was (13.4 µm), where the average width decreased by (3.9 µm) than the average width of the stomata cells in the comparison plant, while it gave the least decrease in the average width of the stomata cells In the wheel area The furthest from the source of the fumes reached (1.1 µm) compared to the cells of the comparison plant, while the decrease was between the lowest and the highest in the Jubbah area, this decrease reached (1.6 µm) compared to the comparison plant. To him [12], where he confirmed in his study that the small size of the cells in the epidermis of the leaves led to the smallness of the stomata cells in particular.

Stomata pores

The pores (holes) of the stomata are an important and main factor for the leaf, as they affect, through their size, the evaporation process of water compared to the percentage of water absorbed from the soil, thus directly affecting the plant growth process. The results in Table (1) showed that cultivation in areas far from the source of fumes led to a reduction in the size of the stomata pores compared to the plants grown near the source of fumes. The average pore size was (10.9) µm, while the average pore size of the control plant was (13.6 µm), where the decrease in the average pore size between the plants grown in the cupboard area and the comparison plant was the least decrease compared to the plants grown in the other regions amounted to (2.7 µm), while this increased The decrease in the size of the pores as the proximity to the source of fumes increases, as the amount of decrease reached (3.5 and 5.9 µm) in the cultivation areas of Jubbah and Alos, respectively. as many stomata as possible, which are the main outlet for the entry of these gases; Which leads to a change in the shape and size of the stomata, and this is consistent with what the researchers indicated [13] [14].

The percentage of chlorophyll in the leaves:

From Table (1), it is clear that the percentage of chlorophyll color A decreased whenever the cultivated plants were close to the source of fumes emission, as the percentage of chlorophyll in plants in the Alos region reached (43.4), where it decreased by a large percentage compared to the percentage of chlorophyll in the comparison plant, and this decrease reached (50.2) The highest decrease was compared to the plants grown in the Jubbah and the Dulab area, in which the percentage of chlorophyll decreased, but to a lesser extent compared to the comparison plant. (3.1), which is a very small percentage when compared to the comparison plant. This decrease in the percentage of chlorophyll leads as a result to a decrease in plant growth as a result of a decrease in the photosynthesis process. This decrease in the percentage of chlorophyll may be due to the entry of So2 gas emitted with the fumes of factories and refineries, which turns inside the paper to sulfur acid, which works to destroy the chloroplasts responsible for the production of chlorophyll, and the chlorophyll in turn turns into pheophytin, and this is consistent with [15].

Table (1) Effect of fumes from a refinery of Haditha on the volume of epidermal cells, stomata cells and their pores, and the percentage of chlorophyll in the leaves of okra plants grown in eastern Haditha

oitar llyhporolhc	**serop atamots**	**sllec atamots**		**sllec lamredipe**		**arko**
		htdiWµm	**htgnelµm**	**htdiWµm**	**htgnelµm**	**noigeR**
93.6 ±0.15	(8.75 -18.75) 13.6	(12.25 -24.75) 17.3	(18.5 -35.5) 26.7	(48.5 –67) 56.5	(87.5 –98) 91.25	nosirapmoC
43.4 ±0.12	(5.75 -10.7) 7.7	(10.5 -19.5) 13.4	(13.25 -30.5) 20.3	(28.25 -49.5) 38.5	(47.5 –69) 56.25	solA
60.4 ±0.21	(7.5-15.25) 10.1	(12.25 -20.75) 15.7	(15 -33.25) 23.8	(41.5 -62.25) 50.25	(63 -75.5) 68	laem
90.5 ±0.21	(8 -14.75) 10.9	(13.5-22.25) 16.2	(14.25 -36) 24	(48.25 -64.5) 55.25	(68.5 –91) 78.75	leehw

The numbers in parentheses represent the lower bound to the upper bound, and the number outside the parentheses represents the average

CONCLUSIONS

The accumulation of polluting elements emitted from a refinery led to a reduction in plant growth resulting from the fumes emitted from the refinery, which led to a reduction in the size of the leaf cells, including the upper epidermal cells and stomata cells, and thus led to a reduction in the size of the stomata openings in the leaves. The fumes rising from the refinery also led to a decrease in the percentage of chlorophyll in the leaves of the plants, and thus led to a decrease in the photosynthesis process, yellowing and death of leaves in some cases, especially in the plants grown in the areas near the refinery.

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