Crackers Dust and its Impact on Some Plants In Sassu Valley, Misurata Region, Libya

El- Soul, M., Mlitan, A, Elgubbi, H. and Alborokey S.
College of Science, Misurata University, Misurata, Libya

Note: This paper is a part of research sponsored by Ministry of Higher Education and Scientific research Libyan Authority for Scientific, Technology and Research (LA'STAR**)**

Abstract:

One of the various causes of plants decline is certainly the industrial expansion and the resultant air pollution of Crushing activities of the naturally occurring stones. The aim of this study was to evaluate the impact of stone crushing industry on different plant parameters in which are dominant in Sassu valley. Measurement of chlorophyll, total carbohydrate, proteins, Amino acids, proline acids, water and metals content; dust fall on plants were done. Sixteen plant spices were identified at this region. The results of this study illustrated that plant species differ in their photochemical contents, and some plant showed a decrease in amount of chlorophyll and total carbohydrate in foliar tissues indicated reduction of photosynthesis. Reduction in both protein and amino acids content in foliar tissues were also noted. Water content was reduced. Measurement of dust fall was carried out and showed high value in all plants. Data analysis of *Zizyphus lotus* and *Haloxylon salicornicum* , *during autumn season, grown in* polluted area (Sassu Valley) and non-polluted area (used as a control) revealed that *Haloxylon salicornicum* more sensitive to dust stone crashers compared to *Zizyphus lotus.* Both tested plant shown an increase in there protein and proline contents and a notable reduction in the amount of chlorophyll, amino acid and water content. *Generally, Zizyphus lotus* and *Haloxylon* salicornicum both xerophytic plants and they have a adoption mechanisms to tolerant pollution stress.
Isolated microbial flora consists of 3 fungal genera belonging to, *Aspergillus*, *Penicillium*, and *Fusarium*. A significant correlation was established in many cases between air pollutants present and plants grown.

keywords: Plants physicochemical parameters, stone crushing dust, Sassu valley.

INTRODUCTION

Air pollution has become a major threat to the survival of plants in the industrial areas [1-2]. We are facing the fact that in relatively recent times, the total amount and complexity of toxic pollutants in the environment are increasing day by day. The chemical effect of dust, either on soil or directly on the plant surface, may be more important than any physical effects. dust has a detrimental effect on people and environment including flora and fauna, for instance, its responsible for vegetation

injury and crop yield losses, are causing increased concern [3]. Effect of cement, petroleum-coke dust, fly ash, coal dust, automobile exhaust; Stone dust and other airborne particulates on various morphological and physiological parameters in different plants were well-studied by several workers [4-11]. Stone dust is primary aerosol and it is released directly from the source. Most of the plants experience physiological alterations before morphological injury symptoms become visible on their leaves. Generally, little is known and limited studies have been carried out on the effects of stone dust pollution on the biodiversity of Sassu valley. This study aims to examine and evaluate the impact of stone dust in Sassu valley in Misurata region on the environment and plants.

MATERIALS AND METHODS:

Description of the study area and selection of study area:

Sassu valley is the field research area lies in Misurata Libya at latitude 32.65 N (north) and longitude 14.26 E (east). The study polluted area is situated around is situated around 200 km east of Tripoli (Libya's capital city). the area holds benefits for farming medical herbs and shrubs. In the summer, the main direction of the wind is from the desert (south) to the sea (North). However, in the winter the wind blows from west to east. Generally speaking, the climate of the area in the summer is hot and dry. The temperature rapidly increases in this season, reaching 48°C. In the winter it is warm and rainy but rainfall is scanty. In Libya, more than 50% probability of occurrence of 10 mm rainfall amounts can be noted in sixteen meteorological stations including the Misurata study area and rainfall of 25 to 50 mm can occur. 26 millimeters is the average annual rainfall for the country.

Identification of area plants:

Several plants were collected from polluted area studied and were identified in Herbarium College of Science, Misurata University, Misurata, Libya. Also taxonomic identification done as described by Encyclopedia of Flora of Libya.

Measurement of dust fall:

Dust fall was also measured, it collected as described by [12] Calculated formula was used in this process as follows:

$W = W2 – W1/ A$

Where, W = Dust content (mg/cm^2), W1 = Weight of envelope without dust, W2 = Weight of envelope with dust A = Total area of leaf in cm^2.

Total Chlorophyll Content:

Chlorphyll determination was carried out according to the method described by [12]. A 0.25 g of fresh leaves were blended and extracted with 10 ml of 80% acetone and left for 15 min. The liquid portion was decanted into another text tube and centrifuged at 2,500 rpm for 3 min. The supernatant was then collected and the absorbance was then taken at 645 nm and 663 nm using a spectrophotometer.

Chlorophyll content was expressed as mg/g fresh weight by using the following formula:

Chlorophyll a = 12.7DX663 – 2.69DX645 x V/1000W mg/g.
Chlorophyll b = 22.9DX645 – 4.68DX663 x V/1000W mg/g.

Ch = chlorophyll a + b , Dx = Absorbance of the extract at the wave length nm.
V = total volume of the chlorophyll solution (ml), and W = weight of the tissue extract (g).

Relative Leaf Water Content (RWC):

The method described by [12], was followed to determine RWC based on the formula,
RWC= (wf – wd) x 100 / (wt – wd).
Where, w fresh wt of the leaf. wt-turgid weight of the leaf after immersing into water overnight. wd-dry weight of the leaf. 0.5 g of leaf pieces were placed in a dryer at 240C for 24 hr.

Total carbohydrate, proteins, Amino acids and Proline acid content:

Determination of total carbohydrates, proteins, Amino acids and Proline acid content according to the method described by [13-15]. The results were presented by mg/g for protein and amino acid and mg/g dry weight for proline analysis.

Fungal Isolation

Fungi were isolated from soil as described by [16].

RESULTS AND DISCUSSION

Identification of area plants:

The plants which were collected from polluted area studied and Plant taxonomically identified in Botany department at Science collage- University of Misurata – Libya. An identified plants including *Olea europaea, Zizyphus lotus, Haloxylon salicornicum, Monsonia nivea, Zilla spinosa, Anvillea garcinii, Marrubium vulgare, Anacyclus alexandrines, Anvillea garcinii, Polygonum* equisetiforme, *Silybum marianum , Orobanche cernua Pituranthos tortuosus, Diplotaxis muralis, Echinops galalensis* and *Atriplex hortensis.*

Dust fall:

The dust fall in the area studied was found to be higher in summer (Table 1). Dust deposition on plant surface was minimum in rainy season and maximum in summer [17]. The dust fall was ranged between 0.05 to 5.30 mg and to be higher with *Silybum marianum*. Quantity of dust fall in all their sites of Sassu valley area, in these principal season exceeded, about 100 times higher in comparison between *Olea europaea* and *Silybum marianum*. A higher dust fall observed on *Silybum marianum* leaf surface may attributed to its leaves constriction such as leaf hairs. leaf is slightly different from plant to other plant regarding the surface texture and any other morphological structures. However, many factors including wind speed and precipitation, may influence particulate deposition [18].

TABLE (1): Measured dust deposition (g) of plant samples, from pollute area.

Plant name	Dust (gm)
Olea europaea	0.05
Zizyphus lotus	0.12
Haloxylon salicornicum	0.44
Monsonia nivea	0.80
Echinops galalensis	1.10
Anvillea garcinii	1.50
Zilla spinosa	2.30
Anvillea garcinii	2.50
Anacyclus alexandrinus	3.10
Polygonum equisetiforme	3.10
Orobanche cernua	3.30
Marrubium vulgare	4.20
Silybum marianum	5.30

Total Chlorophyll Content:

Variation in chlorophyll content has been used in many studies in order to investigate the effects of pollutants on plants total chlorophyll content of selected plant species under study is shown in (Fig.1) . Due to chlorophyll plays an important role in plant growth. All the plant species showed maximum chlorophyll content at all samples with exception of *Orobanche cernua*, *Echinops galalensis*, *Pituranthos tortuosus*, *Silybum marianum* and *Atriplex hortensis*. The variation in chlorophyll content of selected plants may be due to the dust particles [19-20]. Dust accumulation causes severe damage in the soil and may also affected photosynthetic apparatus [21]. The effect of stone crusher dust, which settles on the leaves and becomes a hard mass when comes in contact with water, on the morphology, micromorphology and anatomical details of leaflets [22]. Thus, deposited dust on the surface of leaf alters its optical properties particularly the surface reflectance in the visible and short wave infrared radiation range [23-24]. Results of Prajapati and Tripathi [25] showed the reduction in foliar chlorophyll and carbohydrate content in polluted sites which

indicated that the process of photosynthesis by these trees was reduced as a result of air pollution.

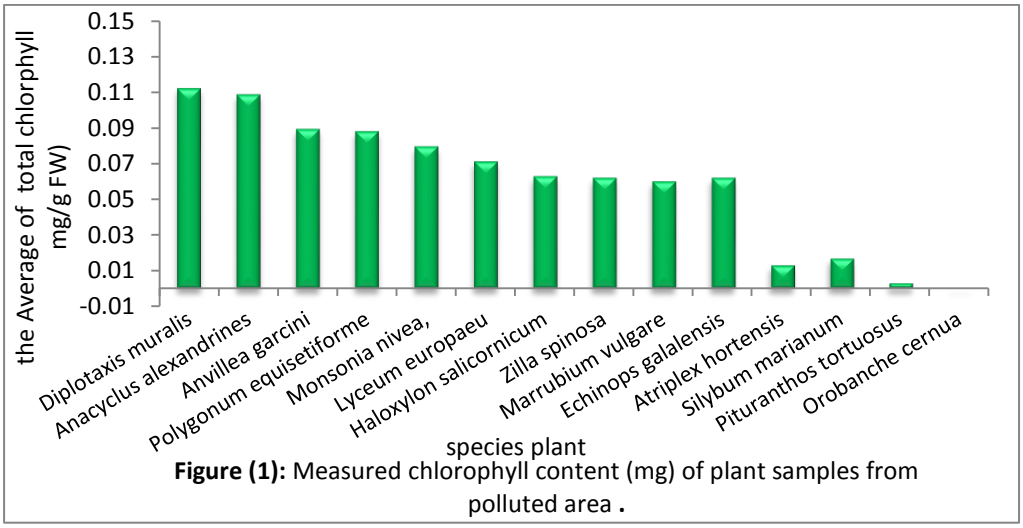
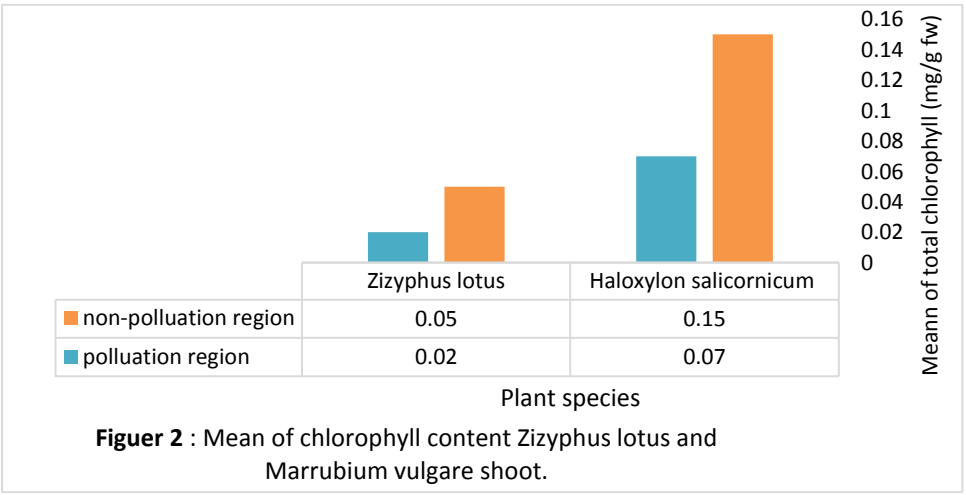


Figure (1): Measured chlorophyll content (mg) of plant samples from polluted area **.**

Chlorophyll content also measured in two plant species (*Zizyphus lotus* and *Haloxylon salicornicum)* grown in polluted area (near to crackers) and non-polluted area (used as a control). In order to, give real indication on the effect of cracker dust on plants. Thus result of this study showed in Figuer (2) and Table (2) revealed that chlorophyll content in the shoot of *Haloxylon salicornicum* grown in polluted area significantly reduced (P=0.02) when compared with chlorophyll content of the same species grown in non-polluted area while chlorophyll content of *Zizyphus lotus* Showed insignificant effect. the reduction of chlorophyll content in the shoot of *Haloxylon salicornicum* due to the amount of dust deposition in the plant surface. the amount of dust in *Haloxylon salicornicum* shoot where four times higher compared with *Zizyphus lotus*. The variation in the amount of dust due to the morphorgical structure of the plant shoot.



Figuer 2 : Mean of chlorophyll content Zizyphus lotus and Marrubium vulgare shoot.

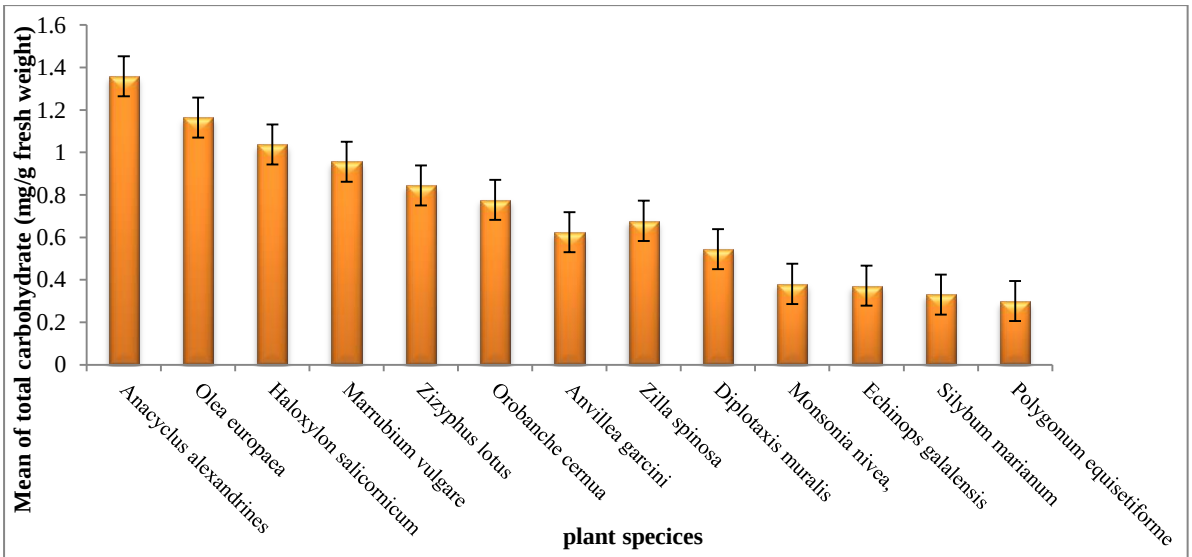
Table (2): Statistical analysis of Chlorophyll content in *Zizyphus lotus* and *Haloxylon salicornicum* shoot.

Species lant	Amount of total carbohydrate)Mg/g fresh weigh)	Number of replactio n	Mean	Std. Deviation	Std. Error Mean	T TEST	
Zizyphus lotus	control	3	189.9	1.7	1.0	F	P value
	Polluation Region	3	8.9	5.2	5.13	4.14	112 UNSIGNFICA NT
Haloxylon salicornicum	control	3	27.31 71	0.58	0.33	F	P value
	Polluation Region	3	90.07	7.7	4.4	10.3	0.03 SIGNIFICANT
	Polluation Region	3	0.23	0.048	0.02		

This study clearly indicated that the stone crushing dust activities induced air pollution problem and affected on the level of chlorophyll pigments in some plants that were exposed to environment pollution. This might be due to long time deposition of dust on plane leaves. The amount of dust accumulated in the plants varied between species this due to their morphological properties.

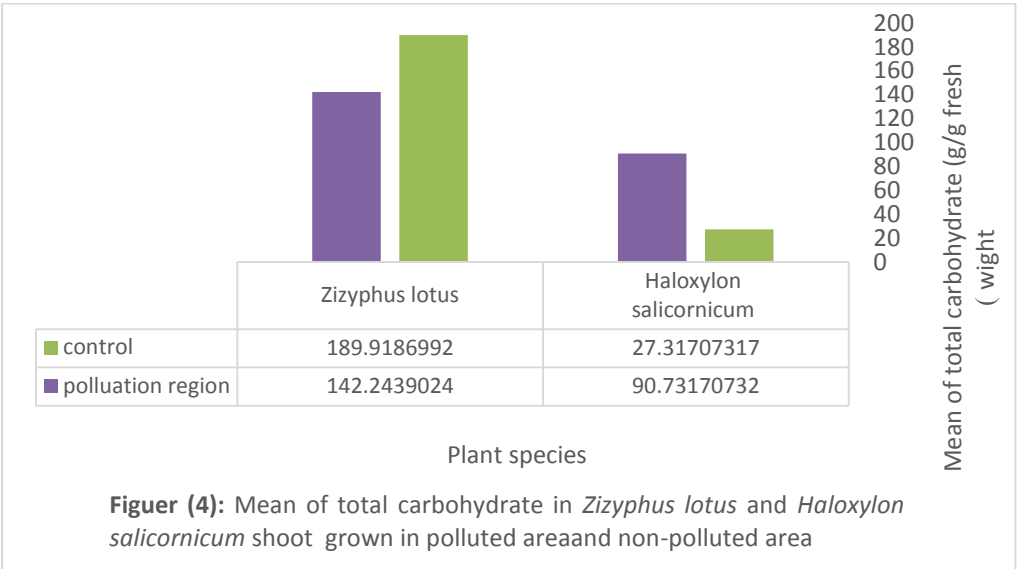
Total carbohydrate, proteins, Amino acids and Proline acid content:

Total carbohydrates in leaves were lower in some tested plants such as *Polygonum equisetiforme*, *Monsonia nivea*, *Echinops galalensis* and *Silybum marianum*, while the degree of differences varied with species at all plants studied (Fig 3). This large difference may be attributed to climatic factors because in the amount of precipitation increased.



Figuer (3): Mean of estimated total carbohydrate from the shoot of some plants grown in polluted and non-polluted area

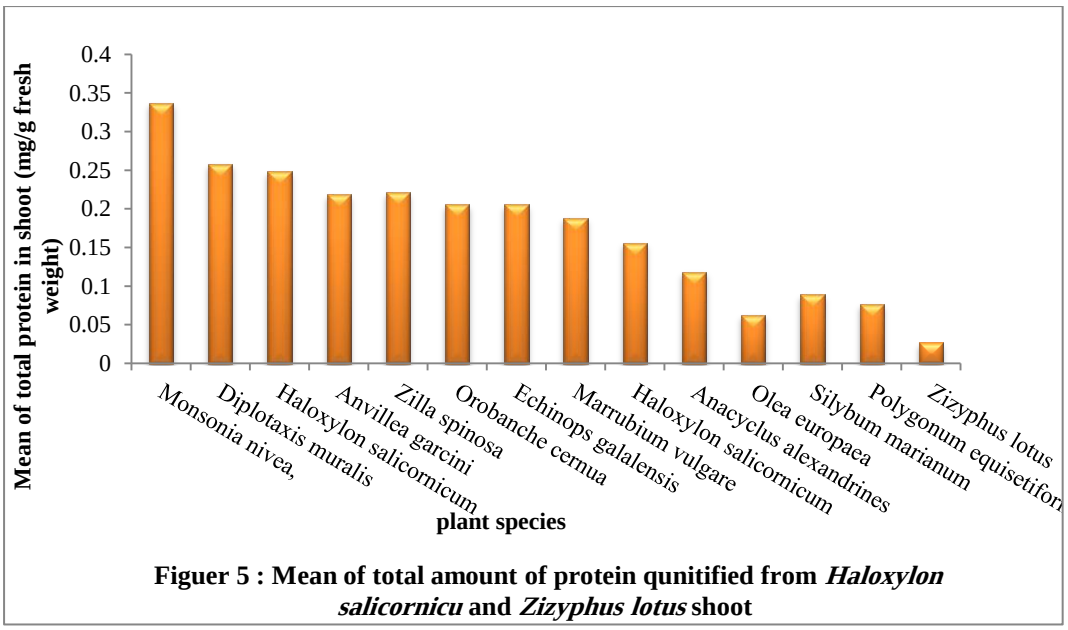
Total carbohydrate was estimated in two species, *Zizyphus lotus* and *Haloxylon salicornicum*, grown in polluted area, near the crackers, and non-polluted area (used as a control). The result presented in Fig. (4) and Table (3) indicated that the amount of total carbohydrate was higher in *Zizyphus lotus* grown in non-polluted area then Zizyphus *lotus* grown in non polluted area. In contrast, the amount of total carbohydrate in *Haloxylon salicornicum* grown in polluted area was significantly higher compared with *Haloxylon salicornicum* grown in non- polluted (P=0.03) suggested that *Haloxylon salicornicum* may be sensitive to cracker dust. an increase in total carbohydrate content, and decrease in chlorophyll amount with high amount of dust deposition on plant surface indicate that *Haloxylon salicornicum*, grown in polluted area, highly affected. while *Zizyphus lotus* showed insignificant increase in total carbohydrate, total chlorophyll and low dust deposition on shoot surface indicated that, *Zizyphus lotus* was more tolerant than *Haloxylon salicornicum*.



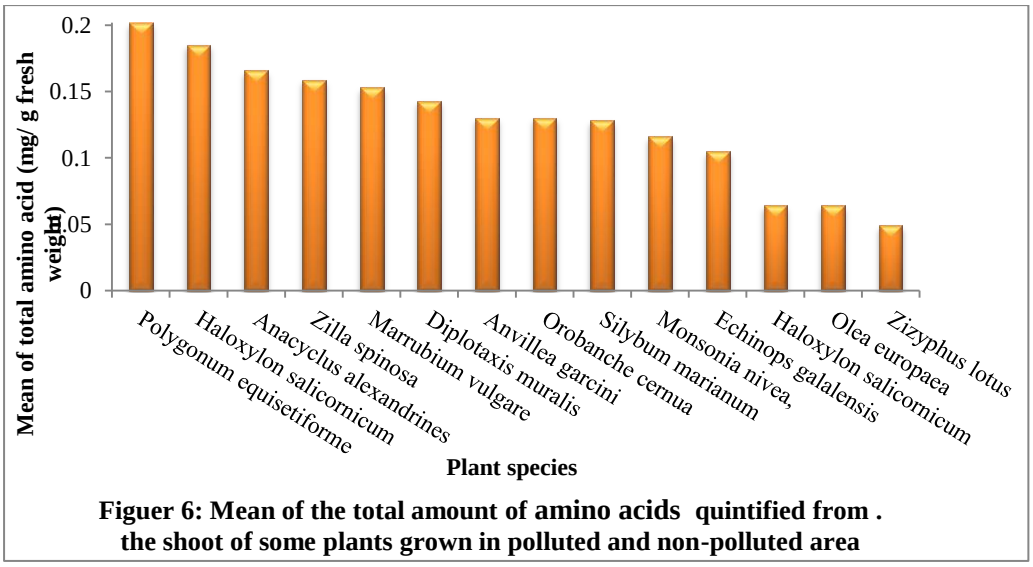
Figuer (4): Mean of total carbohydrate in *Zizyphus lotus* and *Haloxylon salicornicum* shoot grown in polluted areaand non-polluted area

Table (3): Statistical analysis of total carbohydrate in *Zizyphus lotus* and *Haloxylon salicornicum* shoot grown in polluted area, near the crackers, and non-polluted area.

Data presented in Figure (5) showed that the highest amount of total protein was recorder in the shoot of *Monsonia nivea* while the lowest protein amount was estimated in the shoot of *Silybum marianum*, *Zizyphus lotus*, *Polygonum equisetiforme* and *Olea europaea*. Total amino acids were estimated in the shoot of some plant grown in polluted and non-polluted area, as shown in Figure (6). Thus, the highest amount of total amino acid was recorder in the shoot of *Polygonum equisetiforme* while the lowest amount of total amino acid was estimated from the shoot of *Zizyphus lotus*, *Olea europaea* and *Haloxylon salicornicum*.

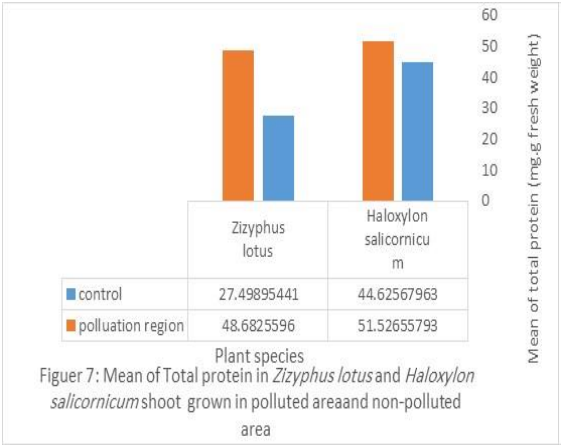


Figuer 5 : Mean of total amount of protein qunitified from *Haloxylon salicornicu* and *Zizyphus lotus* shoot

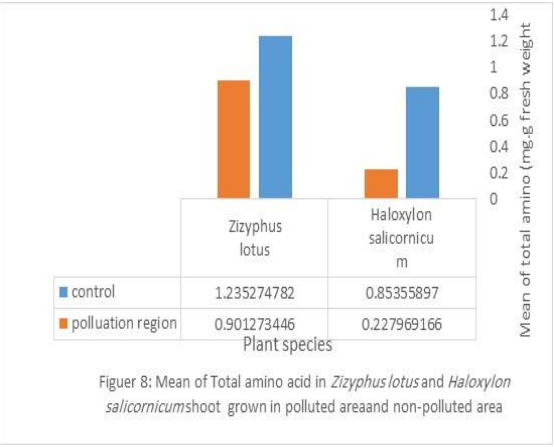


Figuer 6: Mean of the total amount of amino acids quintified from . the shoot of some plants grown in polluted and non-polluted area

Data showed in Figure (7 and 8) and Table (4 and 5) clarified that total protein contents recorded in the shoot of *Zizyphus lotus* and *Haloxylon salicornicum*, grown in polluted area, near the crackers, and non-polluted area (used as a control) showed notable increase while a slight decrease in the total amino acid was recorded.
An increase in protein content may refer to the formation of osmoprotection proteins and may play a role in osmotic adjustment [26] to tolerate stress factors.

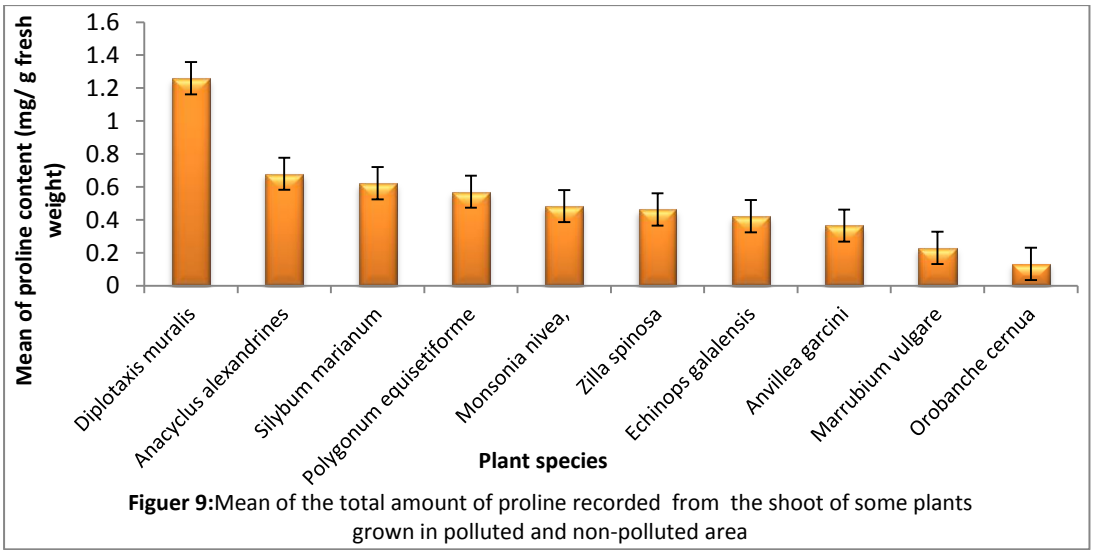


Figuer 7: Mean of Total protein in *Zizyphus lotus* and *Haloxylon salicornicum* shoot grown in polluted areaand non-polluted area

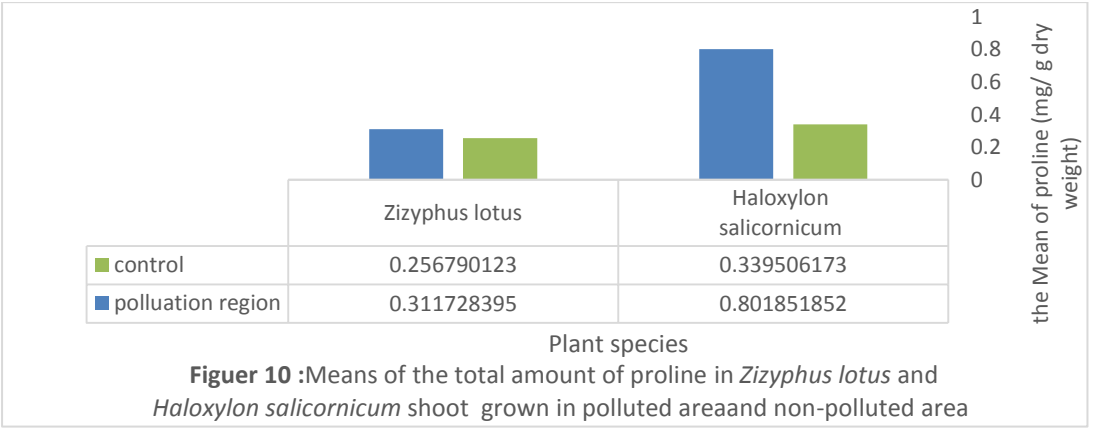


Figuer 8: Mean of Total amino acid in *Zizyphus lotus* and *Haloxylon salicornicum* shoot grown in polluted areaand non-polluted area

Proline content was recorder in some plant grown in polluted area (Sassu Valley), and the data presented in Fig. (9) indicated that proline content was higher in the shoot of *Diplotaxis muralis* and *Anacyclus alexandrines* respectively while the lowest amount of proline content was recorder in three species, *Anvillea garcini*, *Marrubium vulgare* and *Orobanche cernua* respectively. Also, the result showen in Fig. (10) revealed that proline content shown notable increase in both species, *Zizyphus lotus* and *Haloxylon salicornicum* grown in polluted area compared to the same species grown in nonpolluted area.



Figuer 9: Mean of the total amount of proline recorded from the shoot of some plants grown in polluted and non-polluted area



Figuer 10 : Means of the total amount of proline in *Zizyphus lotus* and *Haloxylon salicornicum* shoot grown in polluted areaand non-polluted area

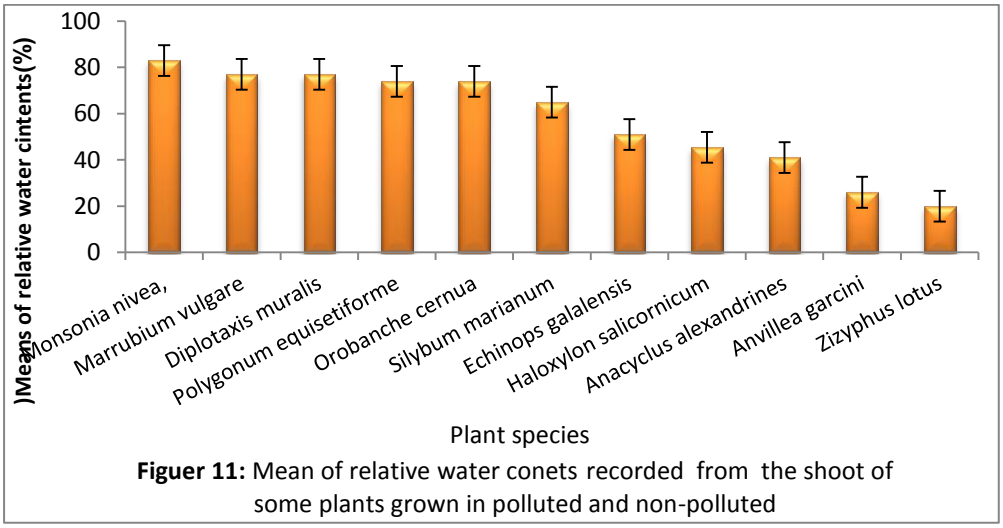
Accumulation of proline is a common plant response to environmental stresses. Proline occurs widely in higher plants and accumulates in larger amounts than other amino acids [27]. Maggio et al. [28] are of the view that proline may act as a signaling/regulatory molecule able to activate multiple responses that are component of the adaptation process. Thus. Proline accumulation in tested plant, *Zizyphus lotus* and *Haloxylon salicornicum* grown in polluted area may refer to their ability to form osmoprotection compound in order to tolerate an environmental stress.

According to the data analysis of chemical composition of *Zizyphus lotus* and *Haloxylon salicornicum* both otein and prolinepr eirin th increase plants showed an content referred to their response to the stress factors. From the result it can be seen that, *Haloxylon salicornicum* is less tolerant to dust pollution because its chemical constitute specially chlorophyll and carbohydrate amounts showed clear reduction which may refers to indirect effect on photosynthesis process. Verma and Singh [29] noticed that, Marked alterations in photosynthetic pigments and protein content in foliar tissues as a result of auto– exhaust pollution. *Zizyphus lotus* was more tolerant to dust pollution because its most chemical components were not affected. Furthermore, the plant was able to induce an increase on osmoprotection compounds such proline and protein. Resistance to environmental stress occurs when a plant withstands the imposed stress that may arise from either tolerance or a mechanism

that permits escape from the situation. Although whole plant mechanism can contribute to the avoidance of stress during the plants life cycle, tolerance can also occur at the cellular level.

Relative Leaf Water Content (RWC):

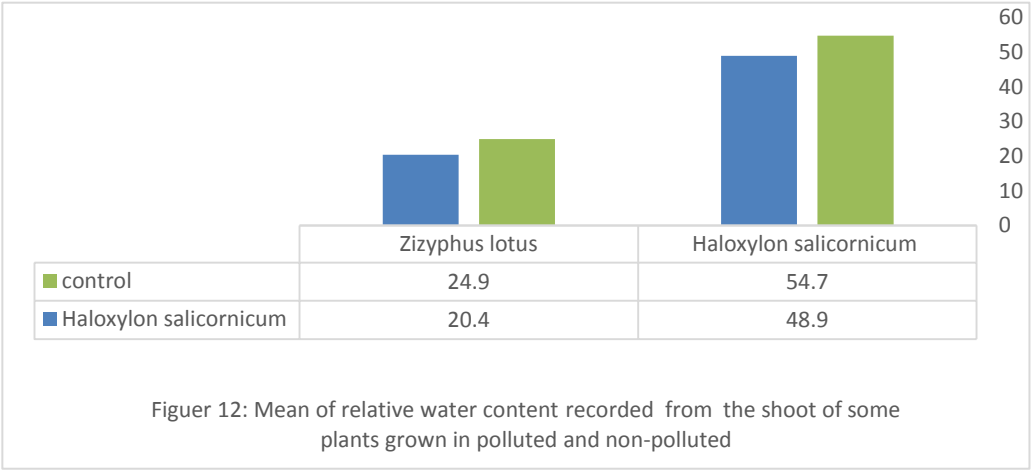
Leaf moisture was measured for all contaminated samples Fig. (11). The results show highly water content of leaves from polluted area sites with exception of *Anvillea garcini* and *Zilla spinosa*. High amount of water in some plants even in polluted area may be to a large Leaf length and leaf area [30]. In addition, these plant leaves may absorbed greatly water due to high dust deposition. In *Zilla spinosa* relative water content is the lowest. This may be due to lower availability of water in soil along with high transpiration rate. An increased water loss was noticed at night if the dust was applied to the lower leaf surface, with applications of smaller dust particles having the most effect. Eveling [31] studied excised leaves of *Phaseolus*, *Coleus* and *Zebrina.* Inert dust applications not only increased water loss, but allowed greater penetration of applications of ammonia.



Figuer 11: Mean of relative water conets recorded from the shoot of some plants grown in polluted and non-polluted

Relative water content was estimated in two plant species, Zizyphus *lotus* and *Haloxylon salicornicum*, grown in polluted and non-polluted area. The result showed that, slight reduction in the shoot water content of *Zizyphus lotus* and *Haloxylon salicornicum* grown in polluted area when compared with the same plant grown in non-polluted area (Fig. 12 and table 4). Both species are able to maintains their water content even they are under stress. Their ability to prevent water loss may due to the morphological properties of the shoot (Fig. 13). *Zizyphus lotus* is xerophytic plants. Its resistant to environmental stress, the leaves of *Zizyphus spp* are thick about 1mm and small. Also, their leaves were coated with cuticle and Leaves surfaces covered by hairs. *Zizyphus lotus* one of drought resistant plant and mostly grown in sandy and sandy-rocky soils [32-34]. Anatomical and Morphological structure of Zizyphus lotus leaves, gained the plant the ability to tolerate stress. *Haloxylon salicornicum* also a xerophytic plants. The plant adopted to prevent stress damage and water loss by

reducing leaf size and area, leaves takes a needle shapes, leaf thickness, sunken stomata Sunken stomata covered with trichromes and formation of thick cuticle .



Figuer 12: Mean of relative water content recorded from the shoot of some plants grown in polluted and non-polluted

Table (4): Statistical analysis of relative water content recorded from the shoot of some plants grown in polluted and non-polluted

Plant Species	water (%) content	Number of replaction	Mean	Std. Deviation	Std. Error Mean	T TEST	
Zizyphus lotus	Control	3	24.6	0.208	120.	F	P
	Polluation Region	3	20.2	0.200	0.125	0.073	0.801 INSIGNFICANT
Haloxylon salicornicu	Control	3	54.6	0.015	0.29	قيمةF	المعنوية
	Polluation Region	3	48.0	1.307	0.75	4.4	0.102 INSIGNIFICANT

Haloxylon salicor- *Zizyphus lotus*

Figure 13: Morphological characters of *Zizyphus lotus* and *Haloxylon salicornicum* leaves

Fungi Isolated From Plant:

There was a number of fungi isolated in this study. Ten species belonging to Three genera of fungi were recovered from all leaves. *Penecillium* sp_1, *Penecillium* sp_2, *Penecillium* sp_3, *Penecillium chrysogenium, Fusarium oxysporum, Aspergillus* sp_1, *Aspergillus* sp_2, *Aspergillus* sp_3 *Aspergillus* sp_4 and *Aspergillus niger*, were the most frequently found fungi in the plants studied in polluted locations . Such fungi were isolated in soil polluted by Stone crushing plants and in leaves polluted by automobile pollution when fungi were isolated from olive leaves that had been exposed to cement dust for a long time, the most common colonies isolated were *Aspergillus*, *Fusarium*, *Mucor*, and *Penicillium* [35-36].

Conclusion:

Plants are suffering particularly around industries including stone crushing dust industries area. Urban dust had a significant effect on the growth of some plant species compared with non-dusted plants. Although plants possess some stress-tolerant mechanisms within them, considerable affect is caused to them which are evident from this study showing physical damage of leaves as a result of dust deposition effect of photosynthetic activities, carbohydrate, proteins, amino acids and proline acids content. This influence on effects of pollutants observed, so the plants at the site closest to the crushing activities had the greatest effects as compared to other.
A Xerophytic plants such *Zizyphus lotus* and *Haloxylon salicornicum* are tolerant either to pollution stress or drought stress. Morphological and anatomical adoption unable those plants to prevent leaves injury and water loss. Thus, both plants are ideal to cultivated in the area of Sassu valley because their resistant to dust stone pollution.

Acknowledgement:

The authors would like to express their gratitude to Libyan National Research Foundation for his supporting to this kind of researches and Botany department, Misurata University for doing this work at their Laboratories.

References:

1- Gupta AK, Mishra RM.; Effect of lime kilnos air pollution on some plant species. *Pollution Research*, 1994, 13(1): 19
2- El-Soul, M. and Mlitan, A.; Cement manufacturing impact on the Prunus and Ficus trees in Margeb region of Libya. The third international conference for development and environment in the Arab world The centre of environment researches in Egypt Assiut-Egypt. 2006.
3- Fuji S (1973). The current state of plant damage by air pollution in *Okayama Perfecture*. *Shokbutsu Boeki* . 1973, 12 : 249- 252.
4- Singh S.N. and Rao D.N.; Growth on wheat plants exposed to cement, dust, pollution. *Water, air and soil pollution*, 1980, 14: 241-249.
5- Prasad B.J. and Rao D.N.; Growth responses of *Pharsalus aureus* plants to petro-coke pollution. *Journal of Experimental Botany*, 1981, 32: 1343-1350.
6- Armbrust D.V.; Effect of particulate (dust) on cotton growth, photosynthesis and respiration. *Agronomy Journal*. 1986, 78: 1078-1081.
7- Agrawal M. and Agrawal S.B.; Phytomonitoring of air pollution around athermal power plant. *Atmospheric Environment* . 1989, 23: 763-769.
8- Pyatt F.B. and Haywood W.J.; Air born particulate distribution and their accumulation in tree canopies, Nottingham, U.K. *The Environmentalist*. 1989, 9:291-298.
9- Liu Y.J. and Ding H.; Variation in air pollution tolerance index of plants near a steel factory: implication for landscape-plant species selection for industrial areas. *wseas Transactions on Environment and Development*. 2008, 4: 24-32.
10- Mlitan, A. and Hack, E.; Some Characteristics and Identification of Fungi Contaminated by Alkomos Cement Factory'. World Academy of Science, Engineering and Technology, International Science Index, *Agricultural and Biosystems Engineering*. 2014, 2(11): 481.
11- El Alkayad, M. Bogola, S. and El-Alati, A. (2016). Effect of automobile pollution on some biochemical activities of roadside plants in Misurata-Libya. *The Third Symposium on Theories and Applications of Basic and Biosciences 5 September* 2016. 5-14.
12- Lorenzini G., Grassi C., Nali C., Petiti A., Loppi S. and Tognotti L.;Leaves of *Pittosporum tobiraas* indicators of airborne trace element and PM distribution in centralItaly, *Atmospheric Environment*, 2006,40: 4025-4036.
13- Dubios, M ; K.A. Gilles ; J.K. Hamilton ; P.A. Rabers and F. Smith . (1956). Colorimetric metod for the determination of sugars and relted substances . Anlyt. Chem. 28 : 350 – 356 .
14- Lawry, C. H.; Farr A. L.. and Bundall H. J. ; Protein measurement with the folin phend reagent. *J. Biol. Chem*. 1951, 193 : 265 – 275 .
15- Lee, Y. P. and Takahashi, T.; An improved colorimetric determination of amino acids with the use of ninhydrin *Anal. Biochem*.1966. 14 : 71 – 77 .
16- Rai B., Pathak K.; Studies on phylloplane microflora of potato in relation to air pollutants. Environmental Pollution Series A*: Ecological and Biological*. 1981, 26:153-166.

17- Saha D C., Padhy P K.; Effects of stone crushing industry on *Shorea robusta* and *Madhuca indica* foliage in Lalpahari forest. *Atmospheric Pollution Research* .2011, 2 .*463-476*.
18- Farmer A.; 2002. Effects of particulates. In: Bell, J. N. B., Treshow, M., Air pollution and plant life, John Wiley and Sons Ltd, 2002, 2nd Edition.
19- Goldsmith C D., Scanlon P F and Pirie W R., Lead concentration in soil and vitiation associated with highway of different traffic densities. *Bull. Environ. Contam. Toxicol*., 1976, 16: 66-70.
20- Leghari SK., Zaidi MA., Sarangzai FM., Shawani GR., Ali. W.; Effect of road side.
dust pollution on the growth and total chlorophyll contents in *Vitis vinefera* L. (grapes). *Afr. J. Biotechnol*.2013, 13: 1237-1242.
21- Hope AS, Fleming JB, Stow DA.; Tussock tundra albedos on the north slope of alaska: Effects of illumination, vegetation composition, and dust deposition. *Journal of Applied Meteorology*,1991, 30: 1200-1206.
22- Anil, K. Rathore, R. and Sharma, A.; Effect of stone crusher dust on leaves of *Melia azedarach* Linn. and Dalbergia sissoo Roxb. in Jammu (J&K). 2008, 7, (2) 279-282.
23- Keller J., Lamprecht R.; Road dust as an indicator for air pollution transport and deposition: An application of SPOT imagery, *Remote Sensing Environment*,1995, 54: 11-12.
24- El- Soul,M. Mlitan A., Elkobi,H and Alhadad A.; Environmental Assessment of Gravel Extraction Activities on Some Soil Physicochemical in Sassu Valley in Misurata Region. .*Journal of Misurata Faculty of Science*. 2015,2 (2): 38-41.
25- Prajapati S.K. and Tripathi B.D.; Seasonal variation of leaf dust accumulation and pigment content in plant species exposed to urban particulates pollution. *Journal of Environmental Quality* ,2008,37: 865-870.
26- Singh N K., Bracken C A., Hasegawa P.M., Handa AK., Buckel S., Hermodson M.A., Pfankoch F., Regnier F.E., Bressan R.A.; Characterization of osmotin. A thaumatin-like protein associated with osmotic adjustment in plant cells. *Plant Physiol*., 1987, 85: 529–536.
27- Abraham E., Rigo G., Szekely G., Nagy R., Koncz C., Szabados L.; Light-dependent induction of proline biosynthesis by abscisic acid and salt stress is inhibited by brassinosteroid in Arabidopsis. *Plant Mol. Biol*. 2003, 51: 363–372.
28- Maggio A., Miyazaki S., Veronese P., Fujita T., Ibeas J.I., Damsz B., Narasimhan M.L., Hasegawa P.M., Joly R.J., Bressan R.A. ; Does proline accumulation play an active role in stress-induced growth reduction. *Plant J*., 2002, 31: 699–712.
29- Verma A. and Singh S.N.; Biochemical and ultra-structural changes in plant foliage exposed to auto-pollution. *Environmental Monitoring and Assessment*. 2006, 120, 585-602.
30- Mlitan, A. El-Soul, O. El Alkayad, M. Bogola, S. and El-Alati, A.; Effect of automobile pollution on some biochemical activities of roadside plants in Misurata-Libya. *The Third Symposium on Theories and Applications of Basic and Biosciences 5 September* ` 2016. 5-14.

31- Eveling, D. W.; Effects of spraying plants with suspensions of inert dusts. *Ann. AppL Biol.*, 1969. 64: 139-51.
32- Abulfatih, H.A., El-Sharief Abdalla, O.A. and Al-Yousuf, A.H. *Desertification and Natural Resources in Qatar*. Department of Agriculture and Water Research, Ministry of Municipal Affairs and Agriculture, *Doha, Qatar*. 111 English pages + 7 Arabic pages, 1999.
33- Abulfatih, H.A., Abdel Bari, E.M., Alsubaey, A. and Ibrahim, Y.M. *Vegetation of Qatar*. Center for Scientific and Applied Research, University of Qatar, *Doha, Qatar*, 2001.
34- Batanouny, K.H. *Ecology and Flora of Qatar*. Center for Scientific and Applied Research, University of Qatar. *Doha, Qatar*, 1981.
35- Salama AM.,.Abdel-Rahman TMA, Ali MI., Abo-Ellil AH., Effect of cement dust sassu pollutant on the phylloplane fungi of *Ficus-nitida* at Helwan Egypt. *Egyptian Journal of Microbiology*, 1988, 23: 329-342.
36- El Soul M. and Mlitan A., Albakosh e., Elserati,M. and Ehbara A., effect of cement dust on soil and its fungal content surrounding margeb factory region, the first plants polluted area unpolluted aresymposium on the theories and applications of basic and biosciences. *University of Misurata*. 2014, 69-84.

الملخص:

إحدى أسباب تدهور النباتات هو التوسع الصناعى و تلوث الهواء الناتج عن نشاط الكسارات للأحجار الطبيعية. يهدف البحث لتقييم تأثير كسارات لأحجار الصناعية على مقاييس نمو النباتات السائدة او الرعوية في وادى ساسو. تم قياس حتوى اليخضور، البروتينات، الاحماض الامينية، السكريات، البرولين ، كمية الغبار و المحتوى المائى. ستة عشر نوع نباتى تم تعريفهم في منطقة الدراسة. نتائج هدا البحث أوضحت بان الأنواع النباتية تختلف في محتواها الكيمائي، بعض النباتات بينت نقصا في محتواها من اليخضور و الكربوهدرات في الأجزاء الهوائية مشيرة بذلك لنقص في عملية البناء الضوئي. أيضا لوحظ انقصا في كمية البروتين و الاحماض الامينية. كما قل المحتوى المائى. قيست كمية الغبار الساقط و بينت النتائج قيم عالية للغبار المتساقط على النباتات. تحليل البيانات لنبات السدر *Zizyphus lotus* و الرمث *Haloxylon salicornicum* ، الناميان في المنناطق الملوثة (منطصة ساسو) و المناطق الغير ملوثة (استخدمت كشاهد) بينت ان نبات الرمث اكثر حساسي لغبار الكسارات من نبات السدر. كلا النباتان شهدا زيادة في كمية البروتين و البرولين كما لوحظ انخفاض في كمية الاحماض الامينية، اليخضور و المحتوى المائى. بصورة عامة، نباتى السدر و الرمث من النباتات الجفافية وهما يملكان ميكانيكية التكييف لإجهاد التلوث . عزلت مجاميع ميكروبية تشمل 3 اجناس فطرية تتبع للاسبرجلس، البنسيلليوم و الفيوزرايوم. اكد في العديد من الحالات الارتباط المعنوى بين تلوث الهواء بالغبار و نمو النبات .

الكلمات المفتاحية: مقاييس الفيتوكيميائية للنبات، غبار أحجار الكسارات، وادى ساسو.