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THE INFLUENCE OF CALCAREOUS EXPLOITATION ON THE MOUNTIN METEIAS ON PHOTOSYNTHESIS AND ASSIMILATING PIGMENTS

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ABSTRACT. Limestone quarry did not affecred the intensity of photosynthesis in the species analyzed, compared to the same species, from an reprezentativ area, except the specie Trifolium sp., in which d = 2.90> 2.57, p = 0.01, that caused the rejection of the null hypothesis. At the other species (Taraxacum sp.: D = 1.52 <1.96, p = 0.05), (Plantago sp.: D = 0.73 <1.96, p = 0.05), (Fragaria sp .: d = 1.46 <1.96, p = 0.05), the null hypothesis can be accepted, the differences between mediums not being significant (in case 1). At the two working mode, the differences between average, in all cases, were significant, with probability levels of 0.001 and 0.01. The only explanation of these differences consisted in calcareous dust deposits on the leaves of species in the quarry area, which explains the rejection of the null hypothesis (in case 2). And also at assimilating pigments null hypothesis is accepted,the difference between average not being significant in both casis of work, case 1 and case 2: Trifolium sp.: D = 0.38 <1.96; p = 0.05; Taraxacum sp.: d = 0.58 <1.96; p = 0.05; Plantago sp.: d = 0.98 <1.96; p = 0.05; Fragaria sp.: d = 0.46 < 1.96;p=0.05.

INTRODUCTION

The problems of mining and their effect on environment are not new in Romania (Miclean et al., 2009; Pandi et al., 2009, 2010). Development-expoitation area Mateiaş-Dealul Hulei is located at the southern end of the massive Iezer-Papuşa,in the calcarous depozit of Mateiaş-Dealul Hulei- Dragoslavele, between the rivers Argeşel,west and Dâmboviţa west, with the mountain peak of V Hulei (1100.5 m) around the perimeter center and Mateias (1239m) peak to the east. Administrative area is located on the territory Valea Mare-Pravãţ, just 11km from the city Campulung Muscel. From the specialized literature informations, it is known that the quarries of limestone contains up to 97.5% calcium carbonate, with free silica, silicates and iron oxides - approx. 2.50% ( ). In addition to these compounds, cement plants, which are usually close to quarries, release into the atmosphere other pollutants as calcium oxide, with the largest share, silicon dioxide, aluminum trioxide and others, and gases such as sulfur dioxide and chlorine in small amounts, about 1.5% and 0.05%. Current legislation is drastic, so many of these compounds is retained by special filters. Blasting activities in the quarries and transport of ore at the cement plant generates dust that is deposited on leaves and woody and herbaceous vegetation species, along with particulate matter released into the atmosphere, and determines,among other effects, reducing the intensity of photosynthesis.

MATERIALS AND METHODS

To know the influence of limestone powder and its use to produce cement, the intensity of photosynthesis and assimilating pigments quantity "a", "b" and "carotenoids" herbaceous and woody species were carried out research in six surfaces, different in terms of vegetation: three in quarry area (coniferous, deciduous, grassland) and three in the control group (coniferous, deciduous, grassland), situated at a distance of 3 km from the quarry. Determination of photosynthesis intensity was performed using S151 carbon dioxide analyzer, which measures the CO2 concentration in room air passed through assimilation / unasimilation where seedlings are found, compared with CO2 in the air before passing through the assimilation chamber. Analyzer is connected to a computer via an interface. .Results are expressed in ppm, and for converting the CO2 mole / l, apply the formula: CO2 / [22,415 * (T + C) / T] Results are reported then second by second, by multiplying with 0.0066 l / s, corresponding amount of air flow 400ml/min. Final results are reported and expressed in mole CO2/m2/s m2. Quantitative determination of assimilating pigments was performed using spectrophotometric method. The amount of pigment in the investigated sample is calculated using formulas given Holm G. 1954, for a liter of extract pigments. This result is related to fresh weight of the sample investigated. Both in the controled surfaces, uninfluenced by deposits, and in those affected, measurements were made at the following plant species: Pinus sp., Carpinus sp. , Fagus sp., Fragaria sp., Platago sp., Trifolium sp., Taraxacum sp. Data on photosynthesis can be summarized in tables in two ways: 1.the average intensity of photosynthesis for each species in all ecosystems analyzed separately for the three ecosystems, uninfluenced by dust deposits and separately for the same types of ecosystems, influenced by dust deposits (Table 1), 2. the average intensity of photosynthesis, separately for each type of ecosystem, by summing the values of each species and the average of each ecosystem (Table 2). For assimilating pigments,

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pigments were calculated a, b and carotenoids, for each species, the ecosystem types (Table 3) were calculated pigments a, b and carotenoids for each species in each ecosystem (Table 4). In all cases, standard deviations were compared for different averages of deposition of dust-free surfaces, with the influence of dust deposits.

RESULTS AND DISCUSSIONS

The fundamental objectives of this workpaper was to obtain data on the influence of limestone dust, resulting in the blasting of ore from Mount Mateiaşu and other products, released into the atmosphere in the cement making process, the intensity of photosynthesis in four species herbaceous (Fragaria sp., Plantago sp., Trifolium sp., Taraxacum sp.), (Objective 1), as well as assimilating pigments (chlorophyll "a", chlorophyll "b" and carotenoid pigments) of three tree species (Pinus sp ., Carpinus sp., Fagus sp) and four grass species (Fragaria sp., Plantago sp., Trifolium sp., Taraxacum sp..) (Objective 2), from the areas investigated .

The Influenton of limestone powder and other products, released into the atmosphere from the cement plants, on the intensity of photosynthesis.

From the analize of Table 1, showing the intensity values of photosynthesis in coniferous and deciduous forest ecosystems and a meadow ecosystem to species: Trifolium sp., Taraxacum sp., Plantago sp., Fragaria sp., is found that the intensity photosynthesis was reduced to species Trifolium sp., at surfaces with dust deposits on leaf surfaces to those uninfluenced by dust deposits. This finding is evidenced by the significant difference of the average intensity of photosynthesis in the area with dust deposition compared to the no deposit one. The standard deviation "d" of the average difference was 2.90, higher than the theoretical deviation of 2.57, with 0.01 prababilitate. In this case, the null hypothesis is rejected. In other species, Taraxacum sp., Plantago sp. and Fragaria sp., photosynthesis intensity was also lower in areas with dust deposits on leaf surfaces to those uninfluenced by dust deposits, but the standard deviation values of the differences between photosynthesis intensity were insignificant: Taraxacum sp. : d = 1.52 <1.96, p = 0.05), Plantago sp.: d = 0.73 <1.96, p = 0.05; Fragaria sp.: d = 1.46 <1, 96, p = 0.05, which leads to acceptance of the null hypothesis. In other words, although the intensity of photosynthesis was higher in areas influenced by dust deposits, compared to those with deposits, we accept the null hypothesis because differences between the averages compared were not statistically significant. When photosynthesis is analyzed by determining the average intensity of photosynthesis of each species, in all areas, separately for affected and unaffected by dust separately for each species "suffers" less because of the deposit dust on the leaves (Table 1).

Microclimate existing surfaces of dust deposition contribute in this case, in the process of photosynthesis of each species with a higher intensity compared to the same surfaces with dust deposits, but establishing a single photosynthetic averag intensity for all species in each surface (Table 2).

Table 1

The influence of dust deposition from Mount Mateiaş career on photosynthesis

Species	Area without dust deposition			Area with dust deposition			Average photosynthesis intensity		Difference Between environments	d" standard deviation of the difference between environments	value standard deviation significance
	C	F	P	C	F	P	Area withou tdust	Area with dust			
Trifolium sp.	4,38	5,39	8,81	2,13	2,57	4,01	6,33	2,90	3,43	2,90	2,90>2,57 p=0,01
Taraxacum sp.	4,42	4,99	7,39	2,38	2,57	5,99	5,60	2,49	1,95	1,52	1,52<1,96
Plantago sp.	3,17	3,18	9,33	1,27	1,56	7,39	5,23	3,41	1,82	0,73	0,73<1,96
Fragaria sp.	3,38	4,29	7,19	1,19	1,58	5,39	4,95	2,72	2,23	1,46	1,46<1,96

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Table 2

The intensity of photosynthesis in some grass species from different types of ecosystem from Mateiasu mountain

Ecosystem type	Determination date	Meteorological factors in determination date: $T^0 C^1$ / $T^0 C^2$	U/R air[1] / U/R air[2] (%)	Light intensity (lux)[1] / light intensity (lux)[2]	Species	The intensity of photosynthesis: Ecosystems unaffected by dust deposition	Ecosystems affected by dust deposition
Forest (conifer)		27,9 / 28,4	66 / 51	3600 / 3500	*Trifolium sp.*	4,379 μmoli $CO_2/m^2/s$	2,129 μmoli $CO_2/m^2/s$
					Taraxacum sp.	4,419 μmoli $CO_2/m^2/s$	2,382 μmoli $CO_2/m^2/s$
					Plantago sp.	3,177 μmoli $CO_2/m^2/s$	1,271 μmoli $CO_2/m^2/s$
					Fragaria sp.	3,381 μmoli $CO_2/m^2/s$	1,191 μmoli $CO_2/m^2/s$
Average photosynthesis intensity						3,839	1,743
The sifference between Average	2,096						
"D", the standard deviation of the difference between average	4,74						
The signifiance of standard deviation	d = 4,74 > 3,291 (DS) Null hypothesis is rejected with a level of probability "p" = 0,001 (0.1%)						
Averige value of photosynthesis intensity						4,464 392 μmoli $CO_2/m^2/s$	2,071 μmoli $CO_2/m^2/s$
Forestier (faget)		27,9 / 28,4	66 / 51	7600 / 8000	*Trifolium sp.*	5,392 μmoli $CO_2/m^2/s$	2,573 μmoli $CO_2/m^2/s$
					Taraxacum sp.	4,988 μmoli $CO_2/m^2/s$	2,572 μmoli $CO_2/m^2/s$
					Plantago sp.	3,184 μmoli $CO_2/m^2/s$	1,563 μmoli $CO_2/m^2/s$
					Fragaria sp.	4,291 μmoli $CO_2/m^2/s$	1,577 μmoli $CO_2/m^2/s$
The difference between average	2,403						
„d", standard deviation of average differences	4,275						
The signifiance value of standard deviation	d = 4,275 > 3,291 (DS) Null hypothesis is rejected with a level of probability "p" = 0,001 (0.1%)						
Meadow		27,9 / 28,4	66 / 51	100000 / 100000	*Trifolium sp.*	8,812 μmoli $CO_2/m^2/s$	4,006 μmoli $CO_2/m^2/s$
					Taraxacum sp.	7,392 μmoli $CO_2/m^2/s$	5,992 μmoli $CO_2/m^2/s$
					Plantago sp.	9,328μmoli $CO_2/m^2/s$	7,388 μmoli $CO_2/m^2/s$
					Fragaria sp.	7,192 μmoli $CO_2/m^2/s$	5,392 μmoli $CO_2/m^2/s$
Averige value of photosynthesis intensity						8,181 μmoli $CO_2/m^2/s$	5,694 μmoli $CO_2/m^2/s$
The diffrence between average	2,487						
„d", standard deviation calculated after average comparations	2,84						
The signifiance value of standard deviation	d = 2,84 > 2,576 (DS) Null hypothesis is rejected with a level of probability "p" = 0,001 (0.1%)						

The values listed in Table 2 shows that photosynthesis intensity averages for all species, but for each type of ecosystem, from area uninfluenced by dust deposits were higher compared to species of surfaces with dust deposits. In all cases, differences between these environments were significant, with different levels of probability: coniferous: d = 4.74> 3.291, p = 0.001; deciduous: d = 4.275> 3.291, p = 0.001; lawn: d = 2, 84> 2.576, p = 0.01. As meteorological factors were very close in all areas and the methodology of photosynthesis intensity determination was the same , carbon dioxide analyzer S 151, the only explanation of the differences between the environments that justify rejecting the null hypothesis, is dust deposits on species leaves limestone quarry area. Photosynthesis is a process whose intensity "respond" quickly to weather conditions, especially light. Therefore, dust deposits on leaves reduces sunlight penetration in plant tissue depth, differently from species to species, which lowers the intensity process. In the areas of unaffected plants by dust deposits on the leaves, the light penetrates deeply into plant tissue, which determins increased intensity of photosynthesis. When photosynthesis is analyzed by type of ecosystem in part (coniferous, deciduous and grassland), by establishing a single average intensity of photosynthesis for all species, ecosystem structural configuration creates a microclimate that lowers the intensity of photosynthesis species in areas with deposits dust on the leaves (Table 2).

The influence of limestone powder and other products, released into the atmosphere from the cement, on assimilating pigmets "a", "b" and "carotenoids".

The influence of deposition of dust from Mount Mateiaş career on assimilating pigments was carried out separately, by setting environments, the types of pigments, for all species (Table 3). In this case, the species of grassland, limestone quarry area, with deposits of dust on the leaves, the average assimilatory pigments "b" differs significantly compared to the same species, of meadow sample, uninfluenced by deposits powders, with a value "d" = 2.24> 1.96 → "p" = 0.05, in which the null hypothesis is rejected. Other pigments and the carotenoids, the species of grass, showed no significant differences between areas affected and those not influenced by dust deposits, in which the null hypothesis is accepted. Assimilating pigments were analyzed for each species in each ecosystem, by establishing a single medium for all assimilatory pigments (Table 4). In this case, the differences between assimilatory pigments of each species, the area affected and those npt influenced by dust, were insignificant, which leads to acceptance of the null hypothesis (Table 4).

Assimilatory pigments determinations were made on the same day and under the same conditions, both weather and in the technique of making determinations as photosynthesis intensity measurements. However, assimilating pigments concentration in leaves was slightly influenced by solar radiation, compared with photosynthesis process, where differences between photosynthesis intensity were significant when the analysis was conducted on each type of ecosystem in part (coniferous, deciduous and pasture), by establishing a single average intensity of photosynthesis for all species , differences in quantities of pigments from the leaves of species in areas influenced by deposits, compared to species affected by the deposition surfaces which are small, insignificant, leading to acceptance of the Null hypothesis.

Table 3

Influence of limestone powder on assimilating pigments

Ecosystem *type*	Species	Ecosiytems unaffected by dust			Ecosiytems affected by dust		
		Asimilating pigments					
		a	b	carotenoids	a	b	Carotenoids
Forest (conifers)	*Trifolium sp.*	1,339	0,869	0,362	1,218	0,709	0,304
	Taraxacum sp.	0,912	0,628	0,318	0,823	0,487	0,216
	Plantago sp.	0,788	0,481	0,303	0,642	0,323	0,141
	Fragaria sp.	1,448	0,982	0,480	1,268	0,862	0,374
	Pinus sp.	0,923	0,622	0,339	0,648	0,398	0,203
Average value of asimilator pigments		1,081	0,716	0,360	0,920	0,556	0,247
Diference bewteen average	Clorpfila „a" : 1,081-0,920 = 0,161; Clorpfia „b" : 0,716-0,556 = 0,16; Carotenoids: 0,36-0,247=0,113						
„d" standard deviationa of average differences	Clorpfila „a": d=0,86<1,96; Clorpfila „b": d=1,19<1,96; Carotenoids: d=1,54<1,96						
The signifiance value of standard deviation	Null hypotesis is accepted for clorpfila „a", clorpila „b" şi pigmenţii carotenoids						

Forest (decidous)	*Trifolium sp.*	0,874	0,643	0,317	0,863	0,486	0,284
	Taraxacum sp.	0,879	0,474	0,268	0,783	0,383	0,185
	Plantago sp.	0,776	0,477	0,322	0,706	0,424	0,289
	Fragaria sp.	1,248	0,719	0,408	1,082	0,667	0,308
	Carpinus sp.	1,802	1,407	0,834	1,486	0,738	0,696
	Fagus sp.	0.909	0,626	0,486	0,783	0,380	0,267
Average value of pigments quantity		1,082	0,716	0,358	0,920	0,556	0,247
The diffrence between average	Clorpfila „a" : 1,08-0,95 = 0,13; Clorpfila „b" : 0,724 - 0,502 = 0,22; Carotenoizds : 0,439 - 0,338 = 0,10						
„d" standard deviation between average differences	Clorpfila „a" : d = 0,66 < 1,96; Clorpfila „b" : d = 1,43 < 1,96; Carotenoids = 0,90 < 1,96						
The signifiance value of standard deviation	Null hypotesis is accepted for clorpfila „a", clorpila „b" şi pigmenţii carotenoids						
Grassland	*Trifolium sp.*	1,328	0,788	0,302	0,987	0,477	0,207
	Taraxacum sp.	0,943	0,631	0,307	0,766	0.387	0,186
	Plantago sp.	0,829	0,387	0,174	0,663	0,288	0,144
	Fragaria sp.	1,063	0,614	0,368	0,827	0,442	0,241
Average value of pigments quantity		1,041	0,605	0,487	0,810	0,398	0,194
The diffrence between average	Clorpfila „a":1,041 - 0,8108 =0,23; Clorpfila „b": 0,605 – 0,398 = 0,207; Carotenoids: 0,487-0,194=0,293						
„d" standard deviationa of average differences	Clorpfila „a": d =1,84 < 1,96; Clorpfila „b": d = 2,24 > 1,96; Carotenoids: d = 1,80 < 1,96						
The signifiance value of standard deviation	Null hypotesis is accepted for clorpfila „a", clorpila „b" şi pigmenţii carotenoids						

Table 4

The influence of dust deposition from Mount Mateiaşu career on assimilating pigments

Ecosystem type	Species	Ecosystems unaffected by dust			Ecosystems affected by dust		
		a	B	carotenoids	a	b	carotenoids
Forest (conifers)	***Trifolium sp.***	1,339	0,869	0,362	1,218	0,709	0,304
	The average	0,857			0,744		
	The difference between averages	0,113					
	Standard deviationa of average differences	0,38					
	significance of standadard deviance	0,38 < 1,96 (p = 0,05) → the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Taraxacum sp.	0,912	0,628	0,318	0,823	0,487	0,216
	Average	0,619			0,509		
	Diference between avreges	0,11					
	Standard deviation of average diffrences	0,58					
	The value signifiance of standard deviation	0,58 < 1,96 (p = 0,05) → the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Plantago sp.	0,788	0,481	0,303	0,642	0,323	0,141
	Average	0,524			0,369		
	The difference between average	0,155					
	Standard deviation of average diffrences	0,98					
	The value signifiance of standard deviation	0,98 < 1,96 (p = 0,05) → the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					

	Fragaria sp.	1,448	0,982	0,480	1,268	0,862	0,374
	Average	0,970			0,835		
	The difference between average	0,135					
	Standard deviation of average diffrences	0,46					
	The value signifiance of standard deviation	0,46 < 1,96 (p = 0,05) the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Pinus sp.	0,923	0,622	0,329	0,648	0,398	0,203
	Average	0,625			0,416		
	The difference between average	0,209					
	Standard deviation of average diffrences	1,25					
	The value signifiance of standard deviation	1,25 < 1,96 (p = 0,05 the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
Forestier (foioase)	***Trifolium sp.***	0,874	0,643	0,317	0,863	0,486	0,284
	Average	0,611			0,544		
	The difference between average	0,067					
	Standard deviation of average diffrences	0,41					
	The value signifiance of standard deviation	0,41 < 1,96 (p = 0,05 the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Taraxacum sp.	0,879	0,474	0,268	0,783	0,383	0,185
	Average	0,540			0,450		
	The difference between average	0,09					

	Standard deviation of average diffrences	0,51					
	The value signifiance of standard deviation	0,51 < 1,96 (p = 0,0505 the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Plantago sp.	0,776	0,477	0,322	0,706	0,424	0,289
	Average	0,525			0,473		
	The difference between average	0,052					
	Standard deviation of average diffrences	0,41					
	The value signifiance of standard deviation	0,41 < 1,96 (p = 0, 05) the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Fragaria sp.	1,248	0,719	0,408	1,082	0,667	0,308
	Average	0,792			0,686		
	The difference between average	0,106					
	Standard deviation of average diffrences	0,45					
	The value signifiance of standard deviation	0,45 < 1,96 (p = 0,05) the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Carpinus sp.	1,802	1,407	0,834	1,486	0,738	0,696
	Average	1,348			0,973		
	The difference between average	0,375					
	Standard deviation of average diffrences	1,39					
	The value signifiance of standard deviation	1,39 < 1,96 (p = 0,05) the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Fagus sp.	0,909	0,626	0,486	0,783	0,380	0,267

	Average	0,674			0,477		
	The difference between average	0,197					
	Standard deviation of average diffrences	1,39					
	The value signifiance of standard deviation	1,39 < 1,96 (p = 0,05)) the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
Pajişte	***Trifolium sp.***	1,328	0,788	0,302	0,987	0,477	0,207
	Average	0,611			0,544		
	The difference between average	0,067					
	Standard deviation of average diffrences	0,33					
	The value signifiance of standard deviation	0,33 < 1,96 (p = 0,05)) the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Taraxacum sp.	0,943	0,631	0,307	0,766	0,387	0,186
	Average	0,540			0,450		
	The difference between average	0,09					
	Standard deviation of average diffrences	0,41					
	The value signifiance of standard deviation	0,41 < 1,96 (p = 0,05 the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Plantago sp.	0,829	0,387	0,971	0,663	0,288	0,144
	Average	0,525			0,473		
	The difference between average	0,052					

	Standard deviation of average diffrences	0,33					
	The value signifiance of standard deviation	0,33 < 1,96 (p = 0,05) the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					
	Fragaria sp.	1,063	0,614	0,368	0,827	0,442	0,241
	Average	0,792			0,686		
	The difference between average	0,106					
	Standard deviation of average diffrences	0,37					
	The value signifiance of standard deviation	0,37 < 1,96 (p = 0,05 the difference is insignificant in statistical terms and therefore the null hypothesis is accepted					

CONCLUSIONS

In order to know the influence of dust generated by the limestone quarry on Mount Mateiaşu and the cement plant, located near-by, on photosynthesis and assimilating pigments content of some herbaceous and woody species in 2011 was conducted ecological research , in hospital, which conducted to the following conclusions: photosynthesis was determined using carbon dioxide analyzer 151, the herbaceous species Fragaria sp., Plantago sp., Trifolium sp., Taraxacum sp. Assimilating pigments were determined by spectrophotometric method, mentioned grass species and woody species Pinus sp., Fagus sp., Carpinus sp.

The influence of dust deposition on photosynthesis intensity was evident in two ways:

1. setting the average intensity of photosynthesis for each species in all ecosystems analyzed separately for the three ecosystems uninfluenced by dust deposits and separately for the same types of ecosystems, influenced by dust deposits (Table 1),

2. setting the average intensity of photosynthesis, separately for each type of ecosystem, by summing the values of each species and setting the averageon ecosystem (Table 2).

In both cases, comparation standard deviations of the differences in surface environments free of dust deposition were followed, with the influence of dust deposits.

By analyzing the standard deviations of average differences photosynthesis intensity , the species in ecosystems uninfluenced by deposits of dust and in those that were influenced is found that table nr.1 case, deposits of limestone powder did not affect the intensity of photosynthesis in the analyzed species, compared to the same species, from thesample area, which may be explained by the creation of a microclimate in the area with dust deposition, which contributes to the process of photosynthesis of each species with a higher intensity compared to the same surfaces with dust deposits, but to establish a single average intensity of photosynthesis for all species in each area. The exception is the species Trifolium sp., Where d = 2.90> 2.57, p = 0.01, leading to rejection of the null hypothesis. In other species (Taraxacum sp.: D1, 52 <1.96, p = 0.05), (Plantago sp.: D = 0.73 <1.96, p = 0.05), (Fragaria sp.: d = 1.46 <1.96, p = 0.05), we accept the null hypothesis that differences between average were not significant. In Table 2, differences between the average in all cases were significant, with probability levels of 0.001 and 0.01. We believe that these differences can be explained by dust deposits on the leaves of species of limestone quarry area, which justifies rejecting the null hypothesis. And assimilating pigments null hypothesis is accepted, not significant differences between: Trifolium sp.: D = 0.38 <1.96, p = 0.05; Taraxacum sp.: D = 0.58 <1.96, p = 0.05, Plantago sp.: d = 0.98 <1.96, p = 0.05; Fragaria sp.: d = 0.46 <1.96, p = 0.05.

Assimilatory pigments in all species analyzed from the areas influenced by dust deposits showed no significant differences compared to the same species, from the affected area and, in this case, the null hypothesis is accepted.

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