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Comparative study on effect of auto-vehicular pollution on morphology and anatomy of two common plant species from Urban areas of Gujrat and Bhimber (AJK), Pakistan

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Key words: Auto-vehicular emission, Morphmetric, Anatomy, *Achyranthus aspera*, Urban pollution, *Chenopodium album,* Gujrat, Bhimber, Azad Kashmir

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Abstract

Global climatic changes caused by urbanization and industrialization revolutionare affecting plants drastically. Auto-vehicular emission is one of factors that increases air pollution. To explore impact of auto-vehicular pollution on plants; two commonly occurring species *Achyranthus aspera* L. and *Chenopodium album* L. were sampled from two cities: Gujrat and Bhimber for comparative analysis. In this research, phenetic and anatomical features of plants were evaluated for determination of impact of auto-vehicular pollution. Morphmetric analysis showed that *Chenopodium album* was more susceptible to pollution than *Achyranthus aspera* in both sampling sites. The leaf size *Chenopodium album* was the most affected in site A (Kacheri Chowk) of Gujrat with 3.333c while in control its value was 6.500a. In other city Bhimber, this reading at site A (Samahni Chowk) was 3.400c whilst at control site its reading was 4.700b. Other morphmetric parameters: leaf width, petiole length and petiole width were also predominantly modified in both taxa due to vehicular pollution. In anatomical analysis, it was found that stem and root epidermis, cortex, xylem and phloem cells of both taxa were considerably modified due to auto-vehicular emissions. In polluted area, epidermal cells of root were reduced (2.7a) as compared to non-polluted sample (2.9a). In urban area of Bhimber; less variation in epidermal, cortex, xylem and phloem cells was explored than urban area of Gujrat (with heavy traffic). The research proves that *Achyranthus aspera* is more resistant to pollution than *Chenopodium album*. These plants had shown good plasticity for absorption of pollution and can be used as bioindicator for air pollution of an area.

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Introduction

Plants have ubiquitous and paramount significance in life of human since emergence of life on planet. Plants have been used as source of food, fodder, medicines, shelter, and aesthetics (Ishtiaq *et al*., 2013). Due to urbanization and industrialization, environmental pollution has been increased constantly. Extensive rise in use of automobiles by human beings has caused increase in air pollution drastically. The automobile emission and industrial effluents are causative agents of hazardous environmental effects on human and plants life. Most of the automobiles emit black smoke due to incomplete combustion of fuel and factory-burning processes also excrete soot particles of various natures (Darwish and Dieyeh, 2009). Pollution emission do excrete different toxic materials such as carbon particles, unburned and partially burned hydrocarbons, fuels, tar materials, lead compounds and other elements which are constituents of petrol and lubricating oils deposit on surface of plants. These pollutants singly or synergistically do impose severe effects on plants parts (Iqbal, 1985). Plants are most affected organisms by pollution and other catastrophes because of static habit. Impact of environmental hazardous is reflected on the plants (Ishtiaq *et al*., 2013).

Auto-emission pollution is not only affecting plants but also human beings. Vehicular emission impact can be detected by studying plants of roadsides or polluted areas. Generally, urban areas are heavily polluted by smoke of vehicles than villages and remote sides. Gujrat is one of the industrialized cities of Pakistan, facing environmental problems due to rapid increase in automobiles, industrialization, burning of solid wastes and domestic fuel exhausts (Majeed *et al.,* 2011). Transport system of city comprises of buses, rickshaws, cars, trucks, motor cycles and locomotive trains; passing through this city. Bhimber is one of districts of Azad Kashmir neighboring of Gujrat city and on other side it is surrounded by Mirpur district and Indian Occupied Kashmir (IOK). This city is surrounded by hilly terrain of mountains with scrub vegetation belt (Ishtiaq *et al*., 2012). It has mild traffic flow, comparatively less affected than Gujrat and vehicular pollution is major plethora hitherto to be addressed. It is seriously threatening study areas by shedding severe impacts on human, animals and plants (crops) (Stevovic *et al*., 2009).

All plants are affected by climatic and anthropogenic activities but herbs are more sensitive to such variations because these have soft structure. Among plant parts; leaf is the most sensitive part being affected by auto-exhaust pollutants, stem is secondary one and roots are least influenced by air pollution as in earth. Leaf is also called bioindicator of air pollution because it is the most sensitive due to its maximum exposure area to air and it is also house of many physiological reactions. The air pollutants emitted from automobiles are directly affecting leaf because they can penetrate into leaf and modify or destroy its cells and tissues, hence hampering its food producing capacity. Air pollution is universal problem of all over the world, particularly in developing countries (Mage *et al*., 1996) and same is prevailing in Pakistan. Heavy metals omitted from automobiles are severely toxic and harmful for plants which show modifications in morphology, anatomy, physiology and biochemistry (Jahan and Zafar, 1992; Gostin., 2009).

Albeit in previous research, many authors have reported effects of air pollution on morphology and anatomy of different plants species grown in different regions (Bhatti & Iqbal, 1988; Gupta & Ghouse, 1988) but hitherto there is scarcity of such type of research about plants of Gujrat and Bhimber urban areas. The aims of present research were: (a) to analyze effects of air pollution on morphology and anatomy of plants species grown on roadsides of city; (b) to determine which plants depict more ecological plasticity and resistance to air pollution and; (c) which species can be good bioindicator of air pollution.

Material and method

Sample collection

The sampling area was selected on those parts of two cities which had severe rush of traffic and depict heavy density abiotic pressure.

Experimental samples of two plants were collected from three sites of urban areas of Gujrat and Bhimber during year 2013. Plant samples of village sides were also collected as control for comparison. The plants sample were collected and stored polythene bag during field work and transferred to laboratory as soon as possible for pre-treatment, analysis and picture were taken with digital camera during survey. Morph metric study was done with help of scale and gets numerical data following protocols of Stevovic *et al*., (2010) and Salgare and Rawal (1990). Samples of contaminated leaves and stems were collected from three sites along roadsides of two cities in triplicate (Table 1). For uncontaminated area (control), leaves and stems were collected from nearby village/and mountains. All samples were collected from same height of plant.

Morph metric Analysis

For phenetic analysis, quantitative characters of taxa such as: leaf length, leaf width, petiole length, petiole width and distance between nodes were measured in triplicate fashion according to protocol of Ishtiaq *et al.,* (2010). Leaf length (cm), width (cm), area (cm^2), petiole length (cm), petiole width (cm) and inter-petiole distance (cm) were determined by using ruler/scale and graph paper method. Leaf morphological characteristics including leaf abnormalities of both young and mature leaves were also observed on the plants of both sites (polluted and non-polluted), with the following criteria *viz.,* change in color (chlorosis, browning, yellowing, spotting or change in the leaf's normal pigment) and shape (normal shape or deformed/modified). The morph metric data was generated in numerical form, tabulated in matrix and further analyzed by statistical test.

Anatomical analysis

For anatomical analysis young, mature and old leaf and stem parts devoid of any disease were collected. The collected parts were washed in water, rinsed in d. dist water. Trim sections were made with off-hand method using sharp blade and mounted on slides for observation under binocular microscope. The sections were first stained with aniline blue for three minutes. The excessive aniline blue stain was washed off and the sections were counter stained with safranine solution for two minutes and then dehydrated with pure xylene after brief interval few seconds (Rezanetad, 2009). The sections are finally observed under light microscope and snaps were captured with digital camera and microscope.

Statistical analysis

The statistical analysis was conducted by using Duncan's Multiple Range (DMR) test determining standard deviation values of means for a comparison of different site categories. To determine the significance of the samples a paired *t*-test was performed (Steel and Torrie, 1980).

Results

It is cosmopolitan overview that heavy industrialization, urbanization and fast growing use of personalized vehicles is creating pollution threat for environment and cause huge disturbances in natural ecosystems. Plants are being most directly affected by such plethoras and plants are also helpful in reducing such pollution as absorber of various toxic gases and metal emission. The plants are also used as phytore mediation process and can be good bioindicator for determining the stress or severity of pollution in an area.

Among all herbaceous plants are more tangible to the environmental stresses and they can be good indicator source to determine the pollution intensity. Hence, in this study, two herbaceous plants *Achyranthus aspera* L. and *Chenopodium album* L. were selected for this study. The plants are easy to collect due to their ubiquitous presence and soft to eradicate. The most prominent part of the plants is leaf, factor of photosynthesis and we have selected its morphological and anatomical analysis.

Theleaf size of *Achyranthus aspera* L. and *Chenopodium album* L. were affected in polluted environment as compared to plants growing at non-polluted area of district Gujrat and Bhimber. Plants found on G.T Road Gujrat, Gujrat city and Bhimber roadsides predominantly affected and their size was mimicked (Table 2).

Gujrat urban area was found more affected as compared to polluted areas of district Bhimber and control sites. In the analysis, it was found that leaf size of *Achyranthus aspera* was significantly (4.167 a) reduced than leaf reduction in other areas of sampling.

Other parameters leaf width, leaf area, petiole length and petiole width were also variable and landmark differential than control area sample characteristic (Table 2; Fig. 1-5).

The petiole length of *Chenopodium album* L. was not significantly affected in district Gujrat while it is significantly affected in district Bhimber showed reduction in size (Table 2) but there variation of is depicted in Fig. 6-10.

Table 1. Names and description of sampling sites from Gujrat and Bhimber City (AK).

Site No	Site Names	Distance from city center and remarks
1	G.T Road near bus stand Gujrat	0.5 km, High-medium traffic pressure
2	Bazurgwal (Gujrat)	10 km, Medium traffic pressure
3	Kahcheri Chowk (Gujrat)	0.2km, Heavy traffic pressure
4	Samahni Chowk (Bhimber)	0.2 km, Heavy traffic pressure
5	Mirpur Chowk (Bhimber)	0.1km Heavy traffic pressure
6	Babe-Kashmir Bridge (Bhimber)	0.5 km, High-medium traffic pressure

Table 2. Effect of Pollution on Morph metric Features of *Achyranthus aspera* L.

Parameters		Areas			
Leaf length (cm)	Sites	Gujrat Polluted	Gujrat Non- Polluted	Bhimber Polluted	Bhimber Non –Polluted
	A	2.200 c	3.300 b	2.167 c	4.267a
	B	2.167 a	3.633 b	3.400 b	4.533a
	C	3.467 b	3.933 b	3.267 b	4.800a
L.S.D.<0.05		0.764433			
Leaf width					
	A	1.5667c	1.733b	1.3000c	2.367a
	B	2.967a	2.167b	1.833 b	2.100b
	C	1.733b	2.2667b	1.833b	2.433a
L.S.D.<0.05		0.37280			
Petiole length					
	A	0.2667c	0.4000 b	0.3000c	0.8000b
	B	2.967 a	0.40000b	0.4333b	0.6000b
	C	1.733 b	0.3333 c	1.3333b	0.733b
L.S.D.<0.05		1.014851			
Petiole width					
	A	0.20000a	0.20000a	0.20000 a	0.20000 a
	B	0.20000a	0.20000a	0.20000 a	0.20000 a
	C	0.20000a	0.20000a	0.20000 a	0.20000 a
L.S.D.<0.05		0.00			
Distance between nodes					
	A	5.367 b	3.600c	5.400b	4.133c
	B	4.700 b	3.267c	4.900b	3.533c
	C	9.57 a	3.033c	4.667b	3.633c
L.S.D.<0.05		3.42677			

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

Table 3. Effect of Pollution on Morph metric Features of *Chenopodium album* L.

Parameters		Areas			
Leaf length (cm)	Sites	Gujrat Polluted	Gujrat Non- Polluted	Bhimber Polluted	Bhimber Non-Polluted
	A	3.333c	6.500a	3.400c	4.700b
	B	5.000b	6.03 a	4.767b	5.500a
	C	4.633b	5.600a	4.100b	5.333a
L.S.D.<0.05		0.760667			
Leaf width					

	A	2.433 b	3.033a	1.933c	2.167 b
	B	3.567 a	3.033a	3.500a	2.933 b
	C	3.367 a	2.833b	3.267a	3.5333a
L.S.D.<0.05		0.7361908			
Petiole length					
	A	1.367 c	2.067b	1.500c	3.200a
	B	3.033 a	4.000a	2.300b	3.133a
	C	3.1333a	1.867c	3.967a	2.900b
L.S.D.<0.05		1.873426			
Petiole width					
	A	0.20000b	0.20000b	0.2000b	0.30000a
	B	0.20000b	0.20000b	0.2667c	0.2667 c
	C	0.20000b	0.20000b	0.2667c	0.2667 c
L.S.D.<0.05		.00087175			
Distance between nodes					
	A	5.500a	3.367c	5.400a	3.667b
	B	4.333b	3.167c	4.400b	2.833c
	C	3.367c	3.333c	3.200c	3.200c
L.S.D.<0.05		1.19560			

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

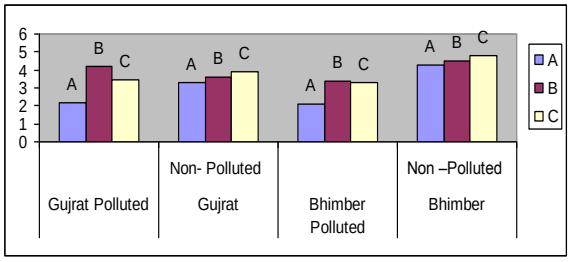

Fig. 1. Effect of Pollution on leaf length *Achyranthus aspera* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

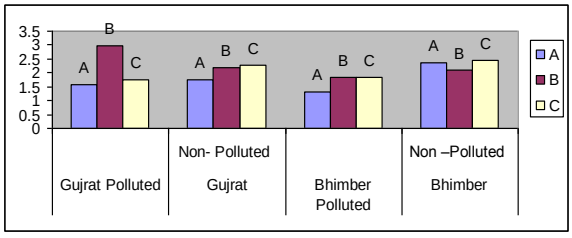

Fig. 2. Effect of Pollution on the leaf width *Achyranthes aspera* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

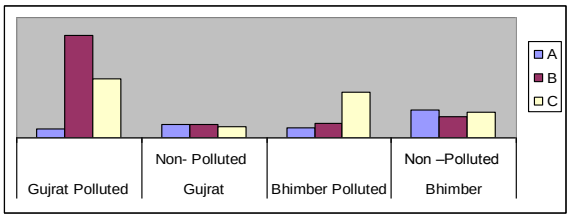

Fig. 3. Effect of Pollution on the petiole length *Achyranthus aspera* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

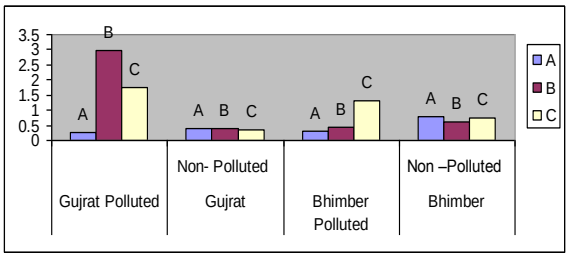

Fig. 4. Effect of Pollution on the petiole width *Achyranthus aspera* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

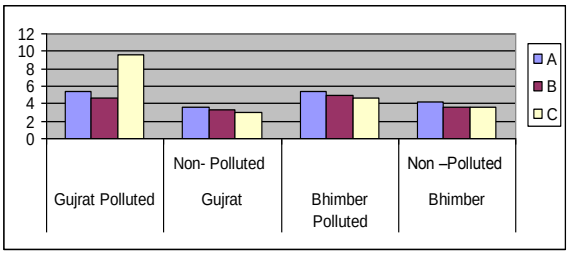

Fig. 5. Effect of Pollution on the distance between nodes *Achyranthes aspera* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

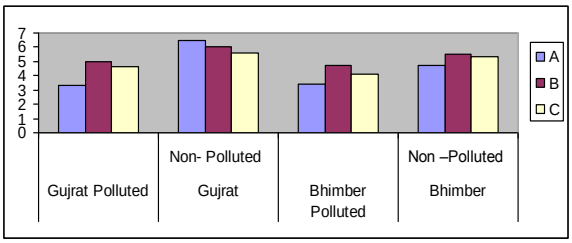

Fig. 6. Effect of Pollution on the leaf length of *Chenopodium album* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

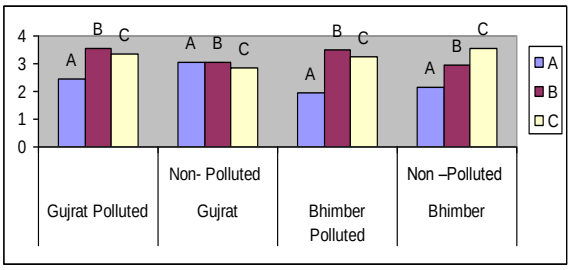

Fig. 7. Effect of Pollution on the petiole width *Chenopodium album* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

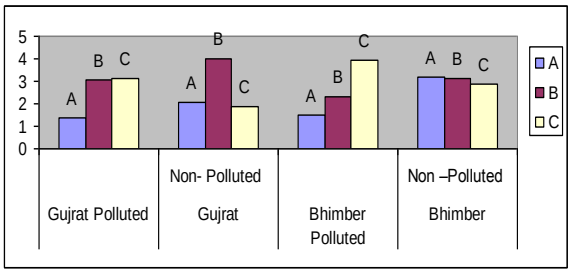

Fig. 8. Effect of Pollution on the petiole width of *Chenopodium album* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

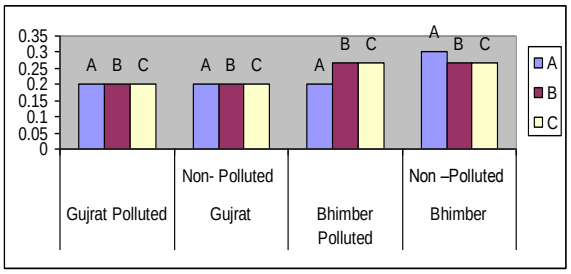

Fig. 9. Effect of Pollution on the petiole width *Chenopodium album* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

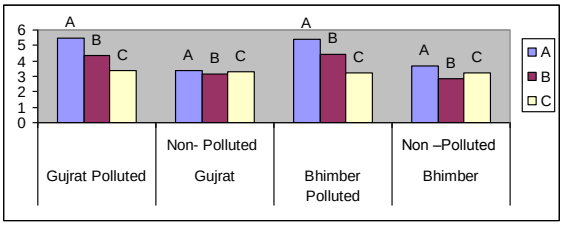

Fig. 10. Effect of Pollution on distance between nodes of *Chenopodium album* L.

A= Kahcheri Chowk (Gujrat), B= G.T Road near bus stand Gujrat, C= G.T Road near bus stand Gujrat.

A= Samahni Chowk; B= Mirpur Chowk; C= Chanatar.

Numbers followed by the same letters in the same column are not significantly different ($p<0.05$) according to Duncan's Multiple range test.

Anatomical studies of stem and root of *Achyranthus aspera* L. and *Chenopodium album* L. were prepared using off-hand trimming technique. Both samples of polluted and non-polluted sites were dissected and slides were mounted under microscope.

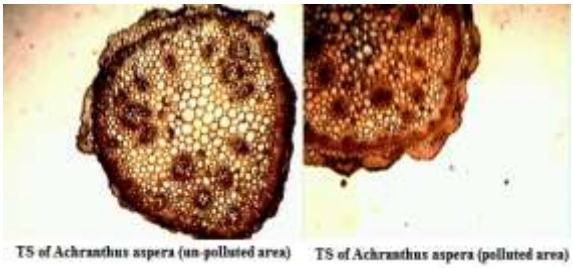

Fig. 11. Effect of pollution on the stem anatomy of *Chenopodium album* L.

Table 4. Effect of Pollution on Stem Anatomy of *Achyranthus aspera* L.

Parameters	Sites	Root	Stem
Epidermal cell size	A	2.7a	5.2b
	B	2.9a	8.3a
	C	2.1b	6.4b
	D	3.1a	8.1a
L.S.D. (p<0.05)		1.851	3.834
Cortex cell	A	5.7b	7.2b
	B	6.1a	7.9b
	C	5.6b	7.2b
	D	6.1a	9.3a
L.S.D. (p<0.05)		1.733	2.636
Xylem cell	A	5.3b	5.6b
	B	6.1a	7.3a
	C	5.4b	6.1b
	D	5.9a	8.3a
L.S.D. (p<0.05)		1.813	3.135
Phloem cell	A	6.4b	4.5
	B	7.2a	6.3
	C	5.7c	5.2
	D	6.2a	6.7
L.S.D. (p<0.05)		2.057	2.676
Pith cell	A	6.1b	35.7b
	B	6.7a	38.4a
	C	5.8b	34.6c
	D	6.1b	37.7a
L.S.D. (p<0.05)		1.807	4.753

A= Gujrat polluted B=Gujrat non-polluted C= Bhimber polluted D=Bhimber non-polluted.
Numbers followed by the same letters in the same column are not significantly different (p<0.05).

A mark-able change in anatomical features of cell size of stem and root was determined for epidermal cell, vascular bundle and pith cell as compared to non-polluted areas (Table 5,6; Fig 11). T.S. of stem and root consisted of epidermis, cortex and central cylinder part and its cortex was consisted of many layers of usually oval parenchyma cells in plants from both localities.

Parenchyma consists of cells had a different shape, size and thin cell walls and chloroplasts. There is a sclera nchymatic sheath between these bundles. Vascular bundles are of different sizes (Fig. 11). Pith cells are large and rounded of all plants which are under studies from both localities.

Table 5. Effect of Pollution on Stem Anatomy of *Chenopodium album* L.

Parameters	Sites	Root	Stem
Epidermal cell size	A	24.3b	2.6b
	B	25.2a	3.1a
	C	24.1b	2.4b
	D	25.4a	2.9a
L.S.D. (p<0.05)		2.077	1.761
Cortex cell	A	2.1b	5.1b
	B	2.4a	5.9a
	C	2.2b	5.6a
	D	2.7a	5.7a
L.S.D. (p<0.05)		1.733	1.779
Xylem cell	A	12.3c	4.3
	B	13.5b	4.2
	C	12.5c	4.1
	D	14.1a	3.9
L.S.D. (p<0.05)		3.974	1.693
Phloem cell	A	4.3b	2.3a
	B	4.7a	2.5a
	C	4.9a	2.1a
	D	5.1a	2.5a
L.S.D. (p<0.05)		1.547	1.701
Pith cell	A	7.3b	15.5b
	B	7.8a	16.3a
	C	7.6a	15.4b
	D	8.1a	16.8a
L.S.D. (p<0.05)		1.823	2.116

A= Gujrat polluted B=Gujrat non-polluted
C= Bhimber polluted D=Bhimber non-polluted.
Numbers followed by the same letters in the same column are not significantly different (p<0.05).

Discussion

Plants are very important biotic factor of earth's ecosystem. Plants are mainstream driver of life sustenance on this planet providing many basic necessities of daily life for human beings. Recently, due to urbanization and industrialization there is degradation in air and environment quality and pollution is rising. Particularly due to industrialization and heavy use of auto-vehicles, there is constant rise in air pollution and it is shedding landmark pressure on flora and fauna of the earth (Ishtiaq *et al.*, 2010). To study impact of air pollution plants are best samples to investigate because they not only face changes in climate and pollution stress but also are acting as phytore mediator for many pollutants.

In this research work; two species *Achyranthus aspera* L.*,* and *Chenopodium album* L. were selected from three sampling sites of Gujrat, Bhimber cities and non-polluted area each. In phenetic studies, it was found that morphology is the most affected feature of plant due to environmental fluctuations. In this analysis, reduction in leaf length width, petiole length, petiole width of roadside plants is the witness of bad effects of polluted city environment as compared with samples of non-polluted areas (Figs. 1-5). It was found that plants growing close to busy road of the city are highly affected than taxa of rural zones. The inhibitory effects on the growth parameters of the plants such as reduction in length are due to the presences of toxic material in the auto-emission (Tables: 2-5).

The results of present study testify this grave situation facing by plants growing at polluted sites of Gujrat and Bhimber urban areas. During the present investigation, it was observed that plants were more sensitive to air pollutants at Gujrat city than of Bhimber area or un-polluted zone. Significantly, reduction in leaf size leaf width, petiole length of *Chenopodium album* L. was found in Gujrat city area and it was less seen in samples of Bhimber city. The reduction in leaf size of *Chenopodium album* L. might be due to large surface area of their leaves that is available to exposure to any pollutants than *Achyranthus aspera* samples. A significant ($p<0.05$) decline in leaf area of a roadside plants, *Bougainvillea spectibilits* had been observed by Hussain *et al.,* (2010). The decrease in leaf parameters could be attributed to high level of automobile pollutants in environment and excessive fall of auto-dust on their aerial parts. Excessive quantity of air carbon dioxides in atmosphere and low intensity of light reaching to leaf are suppressing growth of the plants. Bhatti & Iqbal (1988) reported reduction in leaf length *of Ficus bengalensis* L., at polluted sites. Atmospheric pollutants after making their entry through stomata's of leaves cause reduction in leaf size of plants due to damages of photosynthetic tissue. Since plants growth and production depends on photosynthetic ally functional leaves size of all the tested species were found significantly reduced for plants growing at the polluted sites of city.

Morphological study of roadside plants has been mainly focused by analysing leaf features of these two taxa under investigation. In the results we found that leaf area was reduced in two polluted sampling sites. It was due to infliction of heavy metal pollutants in leaf parts and similar types reduction in "leaf area" growing in vicinity of heavy pollutants was also observed in many plants as reported by previous researchers (Seyyednejad *et al*., 2009; Bhatti and Iqbal, 1988; Gupta and Ghouse, 1988). The reduction in leaf size, width and area might be due to cause of hidden injury or physiological disturbance occurring in morphological and anatomical characters of plants of Gujrat and Bhimber Cities and congruent findings were expressed by past workers that plant species are modified due to air pollution (Gielwanowska *et al*., 2005; Munzuroglu *et al*., 2003).

In second parameter of study, anatomical studies of (*Achyranthus aspera* L. and *Chenopodium album* L.) are mainly focused on stem internal features which are very important for plant growth. Stem anatomy of these two plants showed more reduction in epidermal cell, cortex cell, xylem, phloem, and pith cell size in polluted area of district Gujrat and Bhimber as compared to leaves collected from non-polluted area (Tables 1-5). Significant reduction in vascular bundle of stem and roots of plants from Gujrat area and Bhimber zone was shown as compared with control samples. Many authors in previous years also reported such changes and redundancies in different stem, root and leaf features from polluted environment samples in comparison paradigm with clean atmosphere samples (Darley *et al*., 1963; Davis and Backit, 1978; Jahan and Zafar, 1992).

In the research, it was found that epidermal cells are most affected because they are direct in contact with the environment. These research outcomes proved that environmental pollution is severely affecting plants present in areas of heavy traffic zones of Gujrat and Bhimber Cities.

It was found that Gujrat herbal flora has been facing more injurious effects as compared with plants of Bhimber sites and control zones. In past work it was also reported that due to heavy traffic run of vehicles on the road there is reduction and modifications in epidermal and stomatal structures (Shafiqe *et al.,* 2009). There is dare need to reduce such pollution severity by process using eco-friendly transportation or green buses (with least pollution) and plantation of new plant species which have more plasticity and adaptability to control pollution as sink source from air.

Conclusion

It is concluded from the study that due to vehicular emission of air pollution, many injurious and toxic materials are being entering in atmosphere continuously. The species morphology and anatomy of studied plants proves that heavy metals and other particulate are entering into leaves and plant body (stem) and causing modifications which hinders plant normal growth. These modifications can alter plant structure and growth and biomass of plant taxa. This research recommends that *Achyranthus aspera* L. is better adapted to polluted sites than *Chenopodium album* species. These species may be used as bioindicator of pollution for determining pollution index of an area (urban zone).

References

Bhatti GH, Iqbal, MZ. 1988. Investigations into the effect of automobile exhausts on the phenology, periodicity and productivity of some roadside trees. Acta Soc. Botanica. Polon P. 57.

Darley EF, Dugger WM, Mudd JB, Ordin L, Taylor OC, Stephen ER. 1963. Plant damage by pollution derived from automobiles. Arch. Environ. Health **6,** 700-761.

Darwish MS, Abu-Dieyeh ZH. 2009. Essential oil content and heavy metals composition of *Thymus vulgaris* cultivated in various climatic regions of Jordan. International Journal Agri. Biology **11.** 59-63.

Davis RD, Beckett PH. 1978. Critical levels of twenty potentially toxic elements in Young spring barley. Plant Soil **49,** 395-408.

Gielwanowska I, Szczuka E, Bednara J, Gorecki R. 2005. Anatomical features and ultrastructure of *Deschampsia antarctica* (Poaceae) leaves from different growing habitats. Annals of Botany **96,** 1109-1119.

Gostin NI, 2009. Air pollution effects on leaf structure of some Fabaceae family species Not, Bot. Hart. Agrobar. Cluj **37(2),** 57-63.

Gupta MC, Ghouse AM. 1988. Effects of coal smoke pollutants from different sources in the growth, chlorophyll content, stem anatomy and cuticular traits of *Euphorbia hirta* L. Environmental Pollution **47,** 221-230.

Hussain K, Nisar MF, Majeed K, Nawaz and Batti KH. 2010. Ethno medicinal survey for important plants of Jalapur Jattan, district Gujrat, Punjab, Pakistan, Ethno botanical leaflets **14,** 807-25.

Iqbal MZ. 1985. Cuticular and anatomical studies of white clover leaves from clean and air-polluted areas. Pollution Research **4,** 59-61.

Ishtiaq M, Maqbool M, Hussain T, Shah A. 2013. Role of indigenous knowledge in biodiversity conservation of an area: a case study on tree ethno botany of Soon valley, district Bhimber Azad Kashmir, Pakistan, Pakistan Journal of Botanical **45(SI),** 389-399.

Ishtiaq M, Maqbool M, Hussain T. 2012. Interrelationship of Cultural Diversity, Biodiversity, and its impact on Conservation, Pakistan Journal of Botany **44,** 245-256.

Ishtiaq M, Qi H, Wang Y, Cheng YY. 2010. A Comparative Study of Chemo metric and Numerical Taxonomic Approaches in Identification and Classification of Traditional Chinese Medicines (TCMs) of Genus *Clematis* species, Journal of Plant Bio systems **144-2,** 288-297.

Jahan S, Zafar I. 1992. Morphological and anatomical studies o leaves of different plants affected by motor vehicles exhaust. J. Islamic Acad. Sci **5,** 21-23.

Majeed AM, Kanwal S, Shaukat R, Ilyas R. 2011. Exploration of ethno medicinal values of imperative plants of district Gujrat, Pakistan. Middle East Journal of Scientific Research **7(3),** 397-400.

Munzuroglu EO, Geekil H. 2003. Effects of air pollution acid rain on the pollen germination and pollen tube growth of Apple (*Malus syluestris* Miller W. Golden), Acta Biological Hungarica **54(1),** 95-103.

Rezanetad F, 2009. Air pollution effect on structure, protein and flaovnoids in pollen grains of *Thuja orientales* L. (Cupressaceae) Grana **48:** 205-213.

Salgare SA, Rawal M. 1990. Effect of auto-exhaust pollution at Andheri (West), Bombay on anatomy of some cultivated plants (monsoon season). Journal of Ecobiology, **2(4),** 273-280.

Seyyednejad SM, Nikenjad M, Yuest M. 2009. Study of air pollution effects on Some physiological and morphological factors of *Albizia lebbeck* in high temperature condition in Khuzestan, Journal of Plants Sciences 4(4),122-126.

Shafiqe M, Iqbal MZ, Athar M. 2009. Effect of auto exhaust emission on the penology of *Cassia saimea* and *Peltophorum peterocarpum* growing in the different areas of Karachi PP. 2469-2475.

Shah Z, Iqbal M. 2000. Structural responses of *Cassia sophera* to thermal power plant emissions with reference to distance from the source. In: Yunus, M., Singh, N., De Kok, L.J. (Eds.), Environmental Stress: Indication, Mitigation and Eco-conservation. Kluwer Academic, Dodrecht, The Netherlands, 219-240.

Stevovic SM, ikovlovic VS, Dragosavac DC. 2010. Environmental impacts on Morphology and anatomy structure of Tensy PP. 2413-2421.

Stevovic VS, Mikovilovic S, Dragosavace DC. 2010. Environmental impact on Morphological and Anatomical structure of Tensy 2413-2421.