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Influence of vehicular emissions on metropolitan trees using chlorophyll contents

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Keywords:	Vehicular emission;, urban trees;, chlorophyll;

ABSTRACT

The study assessed carbon sequestration potential of the identified trees {Gmelina, Mango, Neem, Masquerade, Step and Cassia} along the five selected roadsides in Abeokuta metropolitan. Leaves of the identified trees were plucked, digested in triplicate and analysed for chlorophyll (Ch) A, B and A+B contents using UV-visible spectrophotometer. Obtained data were subjected to descriptive and inferential statistics while correlation analysis for relationship between the analysed leaf Ch contents. Results indicated that leaf chlorophyll contents varied. The ranking of tree to metropolitan vehicular emission along roadsides was Neem < Gmelina < Mango < Masquerade tree. Correlation matrix analysis indicated that production of the Ch contents across the roadsides tree species was not alike and might be due to their specific reactions to vehicular emission. In conclusion, the order of Ch contents might be the tree species potential to withstand vehicular pollutants.

Key words: Vehicular emission; urban trees; chlorophyll; uv-spectrophotometer; Abeokuta.

1. Introduction

Mitigating measure to moderate urban air quality has necessitated campaign for tree planting considering various plant species (Bada *et al.,* 2019). Growing of tree species by the roadside is among the natural ways to environmental cleanliness (Varshney and Varshney, 1985). Rapid growth and commercial activities in cities influence high vehicular emissions and in turn present harmful effect on human health and ecology with haphazard effects on roadside growing plants thereby triggering ecological imbalance (Thakkar, 2013). Air pollution by automobiles is very insidious and exerting highly detrimental effects on living organisms including tree (Agrawal, 2005). Increase in vehicular traffic in urban is a great threat with increase in pollutants to which tree species react differently (Bada *et al.,* 2018). Pollutants from the heavy traffic load interfere continuously with tree, especially through plant leaves (Wagh *et al.,* 2006). Study on leaf surface alteration had indicated effects of air pollution on the leaves of trees (Rai *et al.,* 2009). Plant species growing in an adverse environment such as roadside due to vehicular counts present the best material to ascertain levels of tree species susceptibility to physiological disturbance by pollutants unlike drawing interpretations from measurements obtained under lab, screening house or greenhouse conditions (Deepalakshmi *et al.,* 2013).

Trees show various changes in morphology, physiology, anatomy and biochemistry of leaves in a polluted area (Gupta *et al.,* 2012). Photosynthesis process is affected by air pollution and gets inactivated because of the accumulated pollutants that are absorbed through leaf surface (Sims and Garnon, 2002). Leaves are sensitive parts of a tree with abundance of stomata which gives pathways to pollutants penetration to reach the leaf sensitive tissues (Giri *et al.,* 2013). Excess chlorophyll is produced in high temperature but become reduced relatively or stopped in low temperature (Heath *et al.,* 2009). Chlorophyll absorbs light energy and transfers it to the photosynthetic apparatus chloroplast, thereby enhancing plants in urban areas to exhibit an essential role in cleansing the pollution in the environment (Miria *et al.,* 2013). Chlorophyll matter denotes not only plant photosynthetic activity but also biomass growth and development. It varies with species, leaf age, its tolerance and sensitivity, and pollution level (Katiyar and Dubey, 2001). Tree species can develop an adaptation mechanism as strategy to tolerate pollutants and this can make them to have reduction in chlorophyll contents they produce as the resultant effect (Ninave *et al.,* 2001). The observation was reiterated in the later research that the higher the automobile pollution levels along roadsides the lower the chlorophyll contents of the plants along roadsides (Tripathi and Gautam, 2007; Mir *et al.,* 2008). The study evaluated the chlorophyll contents of trees species along selected roadsides in Abeokuta metropolis.

2. Materials and Methods

2.1 Study areas

This study was carried out in Abeokuta metropolis, the capital of Ogun State. The area is located in the sub-humid tropical region of Southwest, Nigeria on the Latitude 70º 5´ N to 70º 20´ N and Longitude 3° l7´ E to 30º 27´ E with a geographical area of 1, 256 km. Abeokuta shares a common boundary with Lagos and Oyo States. The area has a mean annual rainfall of 1090.5 mm and massive rugged geological formations (Akanni, 1992). Forest tree species can be found in some areas within the metropolis, though in haphazard distribution and plan. These areas are the selected roadsides for the study namely Brewery-Itaoshin (BI); Presidential Boulevard-Kuto (PBK); Pansheke-Ojere (PO); Iyana Mortuary-Idiaba (IMI); and Asero-Obantoko (AO). These roadsides had been worked on previously (Bada *et al.,* 2018), when the traffic condition, levels of various pollutants determined and features of the trees were explained. The current research thus found it necessity to determine the plants chlorophyll contents.

2.2 Total chlorophyll contents determination

Three replicates of freshly formed leaves were plucked early in the morning (Leenawaty *et al.,* 2015) and transported to the laboratory of the Department of Environmental Management and Toxicology, Federal University of Agriculture, Abeokuta to determine total chlorophyll (A and B). Total chlorophyll was estimated principally by the method of Arnon (1949). One gram fresh leaf was macerated with 80 % (v/v) chilled acetone and a pinch of magnesium carbonate in a pre-chilled pestle and mortar. The extract was centrifuged at 2500 rpm for 10 minutes. The process was repeated till the extract became colourless. The extracts were pooled and the volume was made up to 15 mL. All operations were carried out in the ice bath under dark condition. Using UV-visible spectrophotometer, the absorbance was measured at 645, 663 and 750 nm. Using A645 = Absorbance at 645 nm minus the absorbance at 750nm; A663=Absorbance at 663 nm minus the absorbance at 750nm; V = Total volume of the extract in mL and W = Weight of the sample in g, Total chlorophyll (TCh) (mg g-1) was calculated.

$$\mathrm{TCh} = (20.2\,(\mathrm{A645}) + 8.02\,(\mathrm{A663}))\ x\ (\mathrm{V}/(1000\ x\ \mathrm{W})) \quad - (1)$$

2.3 Statistical analysis

The data obtained were subjected to descriptive and inferential statistics using SPSS 22.

3. Research findings

Exposure of the plant leaves to the pollution such as vehicular emission has the potential to hinder levels of photosynthetic pigments such as chlorophyll thereby affecting plant physiology (Nithamathathi and Indira, 2005). The effect with inactivated photosynthesis had been ascertained to occur when the pollutants are above the plants physiologically acceptable range (Miszalski and Myllarz, 1990). The leaf samples of the roadside plants plucked for this research had been consistently and constantly exposed to vehicular emissions; they had as a result absorbed, accumulated and integrated the pollutants on their surface with possibility of showing haphazard response such as chlorophyll contents alteration. This could be adopted and used as bio-indicator in the various field of research (Joshi *et al.,* 1997). Differences between both ChA and ChB had been illustrated by Emelda (2011) as ChA is the major photosynthetic pigment and ChB collects energy which is transferred to ChA as the accessory pigment. The ChB is more absorbent while ChA is not. The latter is the reaction center of the antenna array of core proteins while the former regulates the size of the antenna.

Tables 1 and 2 indicated level of ChA and ChB respectively, while Figure 3 represented values of ChA+B across the study roadsides. The quantities of Chlorophyll A (ChA) and Chlorophyll B (ChB) were observed to vary significantly ($p < 0.05$) in Gmelina (*Gmelina arboreal*) tree leaves along all the five roadsides; highest quantity of ChA and ChB was respectively along PO and PBK roads. Highest total Ch(A+B) *G. arboreal* leaf content (31.62 ± 21.22 mg L^{-1}) was detected ($p < 0.05$) along PBK road. There were also significant ($p < 0.05$) variations in leaf ChA and ChB contents of Mango (*Magnifera indica*) tree species along the assessed roadsides.

Their respective highest leaf content was determined ($p < 0.05$) along BI and PBK roadsides while total Ch(A+B) was highest (40.59 ± 27.08 mg L^{-1}) in the leaf contents of *M. indica* along BI and PBK roadside. Neem (*Azadirachta indica*) tree species exhibited no significant ($p > 0.05$) differences in the ChA (highest along PBK roadsides) leaf contents unlike ($p < 0.05$) ChB (highest along BI roadsides) leaf contents.

The highest total Ch(A+B) content (23.83 ± 16.80 mg L^{-1}) was determined in *A. indica* leaves along BI roadsides. The ChA and ChB leaf contents of Masquerade (*Polyalthia longifolia*) tree species differed across the assessed roadsides, except along PBK and BI where the tree species were not present at all. The total Ch (A+B) contents were detected to be highest (56.95 ± 50.00 mg L^{-1}) in the leaf of *P. longifolia* along IMI roadsides. Both Step tree (*Terminalia mentalis)* and Cassia tree (*Cassia seamea)* ChA leaf content was respectively determined 7.42 ± 3.45 mg L^{-1} and 6.17 ± 5.55 mg L^{-1} along PBK and BI road while ChB leaf content was 6.73 ± 4.45 mg L^{-1} and 10.18 ± 7.25 mg L^{-1} respectively. Thus, the total Ch(A+B) of both species' leaf contents were 14.15 ± 7.90 mg L^{-1} and 16.35 ± 12.80 mg L^{-1} respectively. The strength of possible associations (correlations) could be viewed in 5-category: very weak (0.01-0.19), weak (0.20-0.39), moderate (0.40-0.59), strong (0.60-0.79) and very strong (0.80-0.99). However, perfect correlation is said to occur when the value is 1.00. Thus, a value greater than 0 indicates a positive association; that is, as the Ch content of one roadside tree increases, so does the other roadside plant. A value less than 0 indicates a negative association; that is, as the value of one Ch content increases, the level of the other roadside tree decreases. The value with ** and * showed that Ch contents of the two comparing roadside trees is significant at 0.01 and 0.05 the observed data respectively. ChA at BI and AO had a perfect correlation to indicate the tree species at the two location had the same chlorophyll contents and react the same way to the vehicular emission while there was a very strong but negative correlation (-0.979) between ChA at BI and IMI to imply that as the Ch contents of one increased the other decreased i.e. the two plants react indirectly (in opposition way) to the vehicular emission. The ChB content at AO and IMI also had a very strong but negative correlation (-0.979).

4. Discussion

The range of total Ch(A+B) leaf contents of *M. indica* and *P. longifolia* detected in this study was higher than the value: (4.98 ± 0.17 mg L^{-1} and 2.17 ± 0.25 mg L^{-1}) observed previously (Chauban, 2010). The levels of Chlorophyll A, B and total (A+B) of the analysed tree species varied. This did not only indicate different photosynthetic activity, biomass growth and development of the five tree species identified and assessed but also their leaf age, tolerance and sensitivity, and the levels of pollution being exposed to (Katiyar and Dubey, 2001). High levels of the chlorophyll detected indicated that the plant species are being exposed to high temperature (Heath *et al.,* 2009). The high quantity of light energy (Solar radiation) in the study areas is absorbed and transferred to the plant chloroplast to produce high quantity of chlorophyll. This consequently influenced the tree species to be less sensitive (without exhibiting phytotoxic symptoms) but highly tolerant to control metropolitan pollution levels (Miria *et al.,* 2013).

Plant species with less chlorophyll levels might be highly sensitive to the vehicular emissions to corroborate the previous assertions of Ninave *et al.* (2001) that the higher the sensitive nature of the plant species, the lower the chlorophyll contents of the plant species. This could be traced to Neem (*Azadirachta indica*), Gmelina (*Gmelina arboreal*), Mango (*Magnifera indica*) and Masquerade tree (*Polyalthia longifolia*): Neem < Gmelina < Mango < Masquerade tree in low Ch contents but high sensitivity. This conformed to the observations of previous studies (Tripathi and Gautam, 2007; Mir *et al.,* 2008). The studies observed that the higher the automobile pollution levels along roadsides the lower might be the chlorophyll contents of the tree, depending on the tree species.

In conclusion, the study observed that the identified tree species across the five selected Abeokuta metropolitan roadsides had varying leaf chlorophyll contents, which might be due to their specific reaction potential to vehicular emission. The order of Ch contents was observed to follow: Masquerade > Mango > Gmelina > Neem.

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Table 1

Chlorophyll A contents (mg L $^{-1}$) of tree species.

Plant Species Present	AO Road	IMI Road	PO Road	PBK	BI Road
Gmelina (*Gmelina arboreal)*	7.31±5.24a	10.07±8.45b	11.73±9.24c	11.1±5.67c	9.4±5.67b
Mango (*Magnifera indica)*	9.40±3.72a	14.84±10.92b	15.28±12.38c	17.65±6.93d	17.65±10.11d
Neem (*Azadirachta indica)*	6.17±1.28a	6.16±5.13a	6.83±5.55a	9.82±5.57c	7.31±4.35bc
Masquerade tree (*Polyalthia longifolia)*	16.6 ±10.53a	20.58±15.55bc	20.15±10.23b	nd	nd
Step tree (*Terminalia mentalis)*	nd	Nd	nd	7.42±3.45a	nd
Cassia (*Cassia seamea)*	nd	Nd	nd	nd	6.17±5.55a

Values with the alphabet across the row were not significantly (p>0.05) different using DMRT.
nd – not detected.

AO is Asero – Obantoko; IMI is Iyana Mortuary – Idiaba; PO is Pansheke – Ojere; PBK is Presidential Boulevard – Kuto; BI is Brewery – Itaoshin (BI).

Table 2

Chlorophyll B contents (mg L $^{-1}$) of tree species.

Plant Species Present	AO Road	IMI Road	PO Road	PBK	BI Road
Gmelina (*Gmelina arboreal)*	12.51±11.23a	16.19±12.34bc	15.68±12.35b	20.52±15.55d	12.51±9.11a
Mango (*Magnifera indica)*	16.52±12.45a	19.74±15.45b	19.67±10.45b	22.94±20.15c	22.94±15.65c
Neem (*Azadirachta indica)*	10.18±8.75c	7.44±3.24a	12.00±4.56d	8.11±4.35b	16.52±12.45c
Masquerade tree (*Polyalthia longifolia)*	36.87±33.65b	36.37±34.45b	30.58±25.35a	nd	nd
Step tree (*Terminalia mentalis)*	nd	nd	nd	6.73±4.45a	nd
Cassia (*Cassia seamea)*	nd	nd	nd	nd	10.18±7.25a

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Table 3

Pearson's correlation coefficient between leaf chlorophyll and tree carbon contents.

	BI ChA	BI ChB	PBK ChA	PBK ChB	PO ChA	PO ChB	IMI ChA	IMI ChB	AO ChA	AO ChB
BI ChA	1	0.221	-0.477	0.138	0.755	0.904	-0.979	0.890	1.000	0.791
BI ChB		1	-0.161	0.838	0.682	-0.215	-0.042	-0.242	0.221	-0.410
PBK ChA			1	0.364	-0.050	-0.365	0.543	-0.332	-0.477	-0.455
PBK ChB				1	-0.456	0.231	0.963	0.893	0.963	0.791
PO ChA					1	0.752	-0.201	0.066	-0.208	0.138
PO ChB						1	0.476	-0.607	0.464	0.755
IMI ChA							1	-0.956	0.999	0.904
IMI ChB								1	-0.944	-0.979
AO ChA									1	0.890
AO ChB										1

Correlation is significant at the 0.05 level (2-tailed)

Correlation is significant at the 0.01 level (2-tailed)

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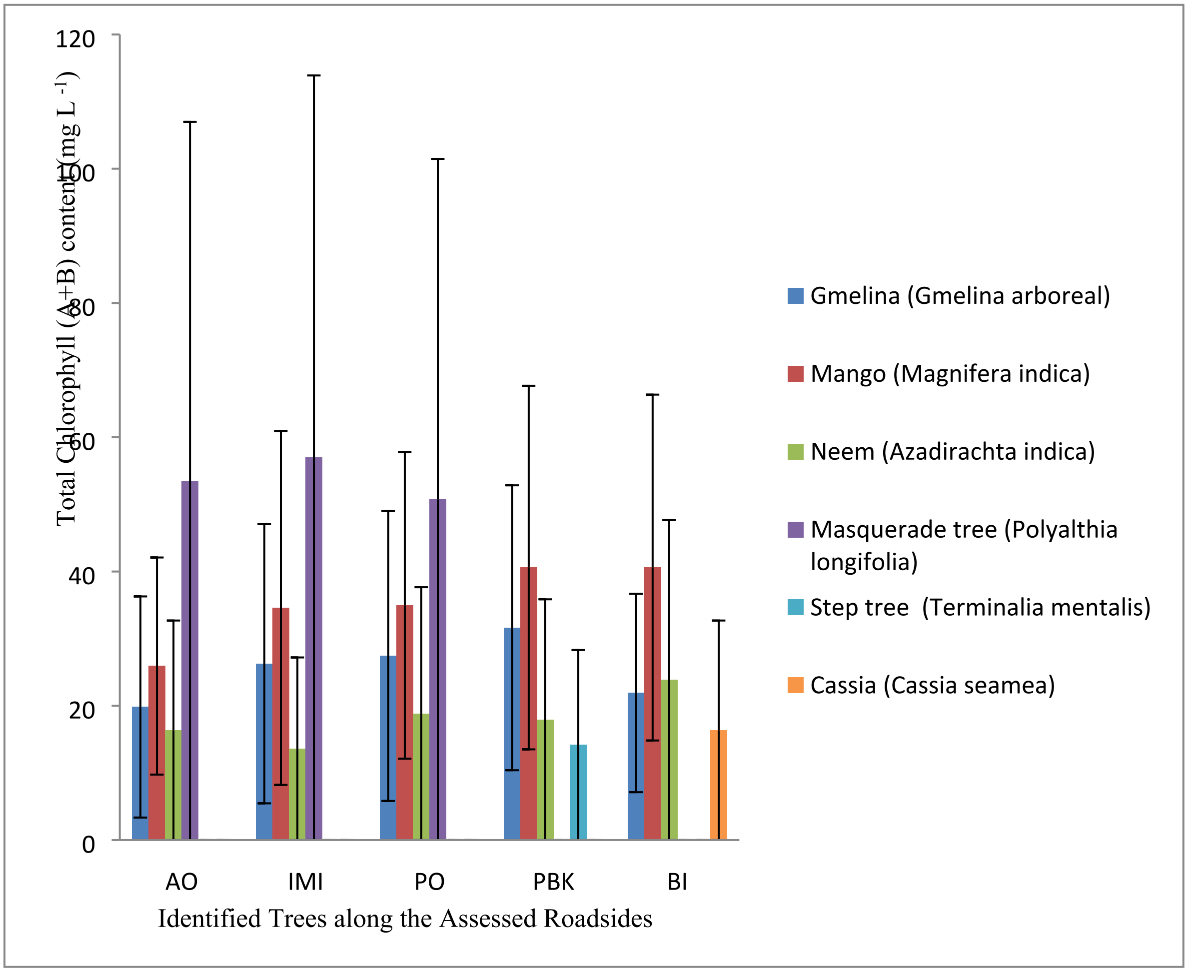

Fig. 1. Mean and standard deviation as error bars of the total chlorophyll (A+B) content (mg L^{-1}) of tree species across the selected roadsides. AO is Asero – Obantoko; IMI is Iyana Mortuary – Idiaba; PO is Pansheke – Ojere; PBK is Presidential Boulevard – Kuto; BI is Brewery – Itaoshin (BI).

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Exposure of the plant leaves to the pollution such as vehicular emission has the potential to hinder levels of photosynthetic pigments such as chlorophyll thereby affecting plant physiology (Nithamathathi and Indira, 2005). The effect with inactivated photosynthesis had been ascertained to occur when the pollutants are above the plants physiologically acceptable range (Miszalski and Myllarz, 1990). The leaf samples of the roadside plants plucked for this research had been consistently and constantly exposed to vehicular emissions; they had as a result absorbed, accumulated and integrated the pollutants on their surface with possibility of showing haphazard response such as chlorophyll contents alteration. This could be adopted and used as bio-indicator in the various field of research (Joshi *et al.,* 1997). Differences between both ChA and ChB had been illustrated by Emelda (2011) as ChA is the major photosynthetic pigment and ChB collects energy which is transferred to ChA as the accessory pigment. The ChB is more absorbent while ChA is not. The latter is the reaction center of the antenna array of core proteins while the former regulates the size of the antenna.

Tables 1 and 2 indicated level of ChA and ChB respectively, while Figure 3 represented values of ChA+B across the study roadsides. The quantities of Chlorophyll A (ChA) and Chlorophyll B (ChB) were observed to vary significantly ($p < 0.05$) in Gmelina (*Gmelina arboreal*) tree leaves along all the five roadsides; highest quantity of ChA and ChB was respectively along PO and PBK roads. Highest total Ch(A+B) *G. arboreal* leaf content (31.62 ± 21.22 mg L^{-1}) was detected ($p < 0.05$) along PBK road. There were also significant ($p < 0.05$) variations in leaf ChA and ChB contents of Mango (*Magnifera indica*) tree species along the assessed roadsides.

Their respective highest leaf content was determined ($p < 0.05$) along BI and PBK roadsides while total Ch(A+B) was highest (40.59 ± 27.08 mg L^{-1}) in the leaf contents of *M. indica* along BI and PBK roadside. Neem (*Azadirachta indica*) tree species exhibited no significant ($p > 0.05$) differences in the ChA (highest along PBK roadsides) leaf contents unlike ($p < 0.05$) ChB (highest along BI roadsides) leaf contents.

Table 1

Chlorophyll A contents (mg L $^{-1}$) of tree species.

Plant Species Present	AO Road	IMI Road	PO Road	PBK	BI Road
Gmelina (*Gmelina arboreal)*	7.31±5.24a	10.07±8.45b	11.73±9.24c	11.1±5.67c	9.4±5.67b
Mango (*Magnifera indica)*	9.40±3.72a	14.84±10.92b	15.28±12.38c	17.65±6.93d	17.65±10.11d
Neem (*Azadirachta indica)*	6.17±1.28a	6.16±5.13a	6.83±5.55a	9.82±5.57c	7.31±4.35bc
Masquerade tree (*Polyalthia longifolia)*	16.6 ±10.53a	20.58±15.55bc	20.15±10.23b	nd	Nd
Step tree (*Terminalia mentalis)*	nd	Nd	nd	7.42±3.45a	Nd
Cassia (*Cassia seamea)*	nd	Nd	nd	nd	6.17±5.55a

Values with the alphabet across the row were not significantly (p>0.05) different using DMRT. nd – not detected.

AO is Asero – Obantoko; IMI is Iyana Mortuary – Idiaba; PO is Pansheke – Ojere; PBK is Presidential Boulevard – Kuto; BI is Brewery – Itaoshin (BI).

Table 2

Chlorophyll B contents (mg L $^{-1}$) of tree species.

Plant Species Present	AO Road	IMI Road	PO Road	PBK	BI Road
Gmelina (*Gmelina arboreal)*	12.51±11.23a	16.19±12.34bc	15.68±12.35b	20.52±15.55d	12.51±9.11a
Mango (*Magnifera indica)*	16.52±12.45a	19.74±15.45b	19.67±10.45b	22.94±20.15c	22.94±15.65c
Neem (*Azadirachta indica)*	10.18±8.75c	7.44±3.24a	12.00±4.56d	8.11±4.35b	16.52±12.45c
Masquerade tree (*Polyalthia longifolia)*	36.87±33.65b	36.37±34.45b	30.58±25.35a	nd	Nd
Step tree (*Terminalia mentalis)*	nd	nd	nd	6.73±4.45a	Nd
Cassia (*Cassia seamea)*	nd	nd	nd	nd	10.18±7.25a

Values with the alphabet across the row were not significantly (p>0.05) different using DMRT. . nd – not detected.

AO is Asero – Obantoko; IMI is Iyana Mortuary – Idiaba; PO is Pansheke – Ojere; PBK is Presidential Boulevard – Kuto; BI is Brewery – Itaoshin.

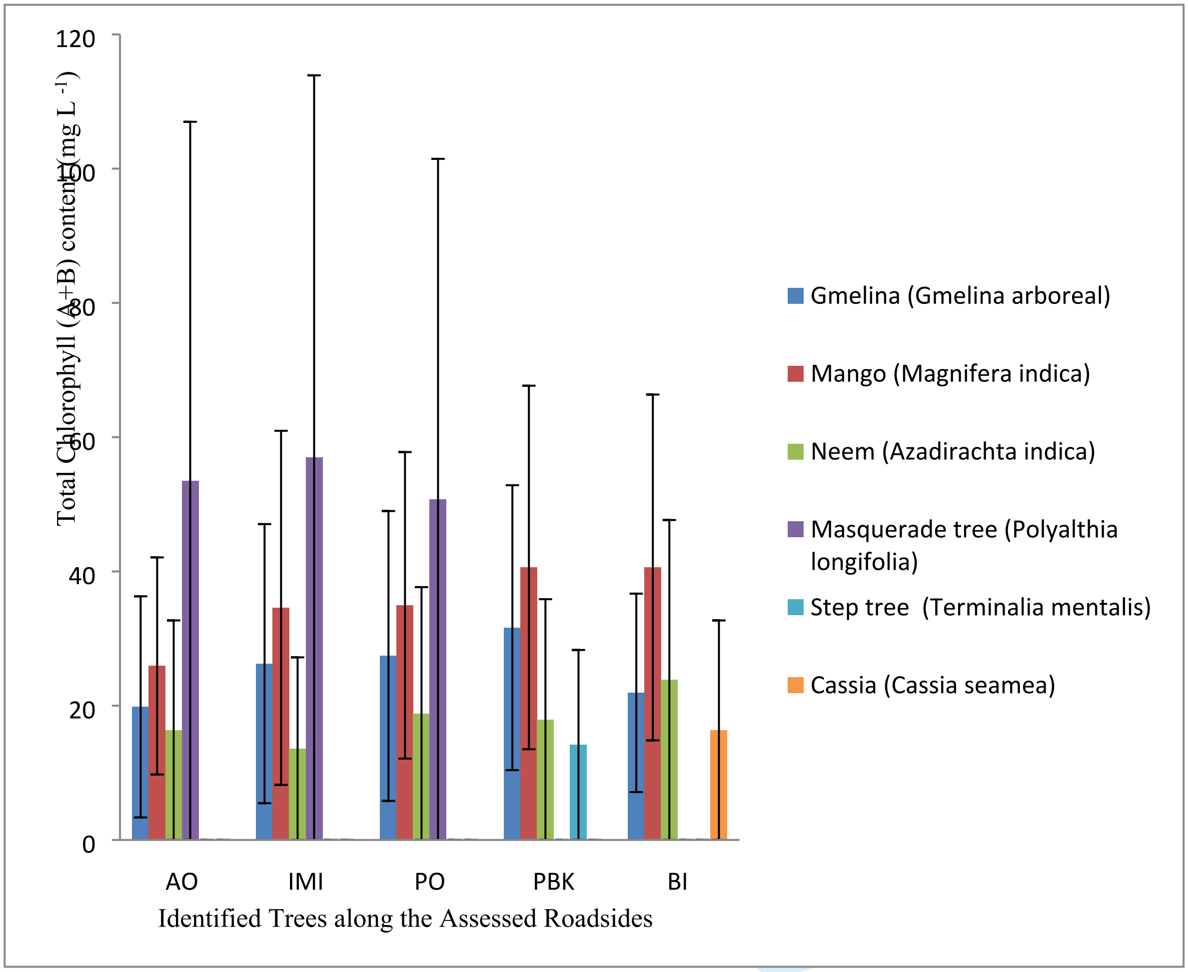

Fig. 1. Mean and standard deviation as error bars of the total chlorophyll (A+B) content (mg L^{-1}) of tree species across the selected roadsides. AO is Asero – Obantoko; IMI is Iyana Mortuary – Idiaba; PO is Pansheke – Ojere; PBK is Presidential Boulevard – Kuto; BI is Brewery – Itaoshin (BI).

The highest total Ch(A+B) content (23.83 ± 16.80 mg L^{-1}) was determined in *A. indica* leaves along BI roadsides. The ChA and ChB leaf contents of Masquerade (*Polyalthia longifolia*) tree species differed across the assessed roadsides, except along PBK and BI where the tree species were not present at all. The total Ch (A+B) contents were detected to be highest (56.95 ± 50.00 mg L^{-1}) in the leaf of *P. longifolia* along IMI roadsides. Both Step tree (*Terminalia mentalis)* and Cassia tree (*Cassia seamea)* ChA leaf content was respectively determined 7.42 ± 3.45 mg L^{-1} and 6.17 ± 5.55 mg L^{-1} along PBK and BI road while ChB leaf content was 6.73 ± 4.45 mg L^{-1} and 10.18 ± 7.25 mg L^{-1} respectively. Thus, the total Ch(A+B) of both species' leaf contents were 14.15 ± 7.90 mg L^{-1} and 16.35 ± 12.80 mg L^{-1} respectively. The strength of possible associations (correlations) could be viewed in 5-category: very weak (0.01-0.19), weak (0.20-0.39), moderate (0.40-0.59), strong (0.60-0.79) and very strong (0.80-0.99). However, perfect correlation is said to occur when the value is 1.00. Thus, a value greater than 0 indicates a positive association; that is, as the Ch content of one roadside tree increases, so does the other roadside plant. A value less than 0 indicates a negative association; that is, as the value of one Ch content increases, the level of the other roadside tree decreases. The value with ** and * showed that Ch contents of the two comparing roadside trees is significant at 0.01 and 0.05 the observed data respectively. ChA at BI and AO had a perfect correlation to indicate the tree species at the two location had the same chlorophyll contents and react the same way to the vehicular emission while there was a very strong but negative correlation (-0.979) between ChA at BI and IMI to imply that as the Ch contents of one increased the other decreased i.e. the two plants react indirectly (in opposition way) to the vehicular emission. The ChB content at AO and IMI also had a very strong but negative correlation (-0.979).

Table 3

Pearson's correlation coefficient of the leaf chlorophyll contents across tree species.

	BI ChA	BI ChB	PBK ChA	PBK ChB	PO ChA	PO ChB	IMI ChA	IMI ChB	AO ChA	AO ChB
BI ChA	1	0.221	-0.477	0.138	0.755	0.904	-0.979	0.890	1.000	0.791
BI ChB		1	-0.161	0.838	0.682	-0.215	-0.042	-0.242	0.221	-0.410
PBK ChA			1	0.364	-0.050	-0.365	0.543	-0.332	-0.477	-0.455
PBK ChB				1	-0.456	0.231	0.963	0.893	0.963	0.791
PO ChA					1	0.752	-0.201	0.066	-0.208	0.138
PO ChB						1	0.476	-0.607	0.464	0.755
IMI ChA							1	-0.956	0.999	0.904
IMI ChB								1	-0.944	-0.979
AO ChA									1	0.890
AO ChB										1

*. Correlation is significant at the 0.05 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed)

BI is Brewery–Itaoshin, PBK is Presidential Boulevard–Kuto, PO is Pansheke–Ojere, IMI is Iyana Mortuary–Idiaba, AO is Asero–Obantoko, ChA and ChB are chlorophyll A and B.

4. Discussion

The range of total Ch(A+B) leaf contents of *M. indica* and *P. longifolia* detected in this study was higher than the value: (4.98 ± 0.17 mg L^{-1} and 2.17 ± 0.25 mg L^{-1}) observed previously (Chauban, 2010). The levels of Chlorophyll A, B and total (A+B) of the analysed tree species varied. This did not only indicate different photosynthetic activity, biomass growth and development of the five tree species identified and assessed but also their leaf age, tolerance and sensitivity, and the levels of pollution being exposed to (Katiyar and Dubey, 2001). High levels of the chlorophyll detected indicated that the plant species are being exposed to high temperature (Heath *et al.,* 2009). The high quantity of light energy (Solar radiation) in the study areas is absorbed and transferred to the plant chloroplast to produce high quantity of chlorophyll. This consequently influenced the tree species to be less sensitive (without exhibiting phytotoxic symptoms) but highly tolerant to control metropolitan pollution levels (Miria *et al.,* 2013).

Plant species with less chlorophyll levels might be highly sensitive to the vehicular emissions to corroborate the previous assertions of Ninave *et al.* (2001) that the higher the sensitive nature of the plant species, the lower the chlorophyll contents of the plant species. This could be traced to Neem (*Azadirachta indica*), Gmelina (*Gmelina arboreal*), Mango (*Magnifera indica*) and Masquerade tree (*Polyalthia longifolia*): Neem < Gmelina < Mango < Masquerade tree in low Ch contents but high sensitivity. This conformed to the observations of previous studies (Tripathi and Gautam, 2007; Mir *et al.,* 2008). The studies observed that the higher the automobile pollution levels along roadsides the lower might be the chlorophyll contents of the tree, depending on the tree species.

In conclusion, the study observed that the identified tree species across the five selected Abeokuta metropolitan roadsides had varying leaf chlorophyll contents, which might be due to their specific reaction potential to vehicular emission. The order of Ch contents was observed to follow: Masquerade > Mango > Gmelina > Neem.

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