

IMPACT OF CEMENT DUST ON AZADIRACHTA INDICA LEAVES - A MEASURE OF AIR POLLUTION IN AND AROUND ARIYALUR

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ABSTRACT

Ariyalur, situated in Tamilnadu is rich in limestone and there are many cement factories in and around Ariyalur. Six lakes in and around Ariyalur was considered for the study and *Azadirachta indica* leaves commonly known as neem leaves from neem trees were collected for estimation of total chlorophyll content, chlorophyll 'a', chlorophyll 'b' and moisture content. The estimated chlorophyll and moisture contents were compared with control. It was found that both the chlorophyll and moisture levels in the leaves were less in all the six locations in and around Ariyalur. The reason is attributed to the accumulation of cement dust on the leaves resulting in retarded growth of the trees. Hence, the estimation of chlorophyll content and moisture content can be taken as a measure of air pollution. Water has to be sprinkled, if grown, on the leaves of trees or plants for removal of cement dust for the healthy growth of the plants.

INTRODUCTION

Ariyalur is an important place in Tamilnadu, located in Perambalur district. It is located 250 Kms south west of Chennai and 60 Kms from Trichy - Chennai railway line passes through Ariyalur. It is also called as 'Cement City' as there are many cement plants in and around Ariyalur. There are many limestone mines in and around Ariyalur and the soil is rich in limestone. Hence, there

is heavy amount of smoke released in the surrounding areas polluting the environment. Electro Static Precipitator abbreviated as ESP are mandatory for the cement factories which minimizes the dust particles by electrostatic precipitation for making the environment clean. Even after the instillation of ESP, air pollution level in Ariyalur is reported to be high.

For the estimation of air pollution levels, six lakes in and around Ariyalur were considered for the study. *Azadirachta indica* leaves commonly known as Neem leaves were collected from the neem trees around these lakes, for the estimation of chlorophyll content, both chlorophyll 'a' and chlorophyll 'b' and moisture content. Control neem leaves were collected from Srirangam along the river coloroon, since, the place is considered to be free from cement dust or in general the river bed in Srirangam is considered to have less pollution.

Neem leaves (*Azadirachta indica*) were considered because it has resistance to infestations due to pests (Naumann *et al.* 1999). Hence, if the study reveals less chlorophyll levels, the reason can be mainly attributed to the deposit of cement dust on the leaves (Agrawal *et al.* 1991). Trees around lakes were considered because it will have water supply almost through out the year. Chlorophyll 'a' and chlorophyll 'b' were analyzed because both have a slight structural difference but both compliment each other in the process of photosynthesis, by absorbing sun light. Cement dust is a polluting agent (Lal & Ambasht 1980). In a place like Ariyalur, which is surrounded by many cement factories, one can not determine the effect of air pollution due to a single factory, which is releasing large amount of cement dust, at a given place. The air pollution due to cement deposits is due to the effect of dust released from various factories. Also, the pollution level depends on many factors such as air drag, particle size (of cement dusts), seasonal variation, effect of moisture, rain and other factors as described by Mathur *et al.* 2003. It becomes very difficult to find these factors at a given place and to predict the exact extent of damage produced by a single factory at one particular place. Hence, only bio monitoring is helpful to find the extent of damage caused due to the cement dust in one particular place.

The calculation of chlorophyll content in leaves gives an accurate measure of the pollution at a given place. This method is called as bio monitoring of air pollution levels (Ali *et al.* 1993). Also, the method for the calculation of chlorophyll content in leaves is easy and is not very expensive. This method of calculation of chlorophyll content can be extended to any locality wherein the complexities in the calculation of air pollution levels are more and complicated. In this study, neem leaves were considered for the measure of chlorophyll levels and the study was done around six lakes in and around Ariyalur.

MATERIALS AND METHODS

Neem leaves were collected from Allinagaram, Eruthukaranpatti, Thauthaikulam, Manaleri, Valajanagaram and Kallankuruchi areas adjacent to the lakes Thamarai, Cinneri, Chitaeri, Perieri, Theppakulam and Kallankuruchi Lake respectively which are in and around Ariyalur and transported to the laboratory. Neem leaves from Srirangam, were collected in plastic bags and transported to the laboratory. Total Chlorophyll, Chlorophyll 'a' and

chlorophyll 'b' were measured as devised by Arnon (1969). Moisture level in the leaves were also calculated, which is the ratio of (Initial weight - final weight) and Initial weight multiplied by 100. The difference between the control and the samples were also calculated which has a direct impact on the level of pollution.

RESULTS AND DISCUSSION

The total chlorophyll content, chlorophyll 'a' and chlorophyll 'b' content are tabulated in Table 1. The moisture content is tabulated in Table 2. It is clear from Table 1 that chlorophyll 'a' content is low in the neem leaves near all the six lakes. The chlorophyll 'b' content is also found to be low near all six lakes in and around Ariyalur, when compared with the control. When comparing the moisture content, it is also found to be low in neem leaves near all the six lakes, when compared with the control. From this study, it can be understood that the effect of cement dust deposited on the neem leaves reduces the chlorophyll content as well as the moisture content in the leaves. The reason being the deposition of cement dust on the leaves prevents the sun light falling on the leaves thereby reducing the chlorophyll content. Hence, the measure of total chlorophyll content in the leaves can be considered as a measure of the level of pollution. From Table 1, it can be seen that the difference between the chlorophyll content between the control and the affected leaves is high in valajanagaram; hence valajanagaram is most affected due to the pollution. Allinagaram and Thauthaikulam come next followed by Kallankuruchi. Eruthukaranpatti is less polluted and Manaleri is least polluted. It is also seen that the chlorophyll 'a' and chlorophyll 'b' are also less in these areas when compared with control. The percentage of moisture content taken in the same period is less compared with the control which implies that the leaves are depleted from adequate water. Hence, it is proved that the areas in and around Ariyalur is polluted due to cement dust even after the instillation of ESP in the cement factories around Ariyalur. This may be due to the improper functioning of ESP in those factories.

Further, health of the plant is highly affected due to cement dust pollution. Hence, if plants are grown, in gardens, water has to be sprayed or sprinkled on the leaves for the healthy growth of plants. Also, the measure of chlorophyll content in the leaves gives us the level of pollution present in a particular place. Since, the cost of measuring the chlorophyll content is less, the chlorophyll content of leaves of a particular plant can be monitored periodically, which will indicate the level of air pollution.

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Table 1

Chlorophyll levels at different places near Ariyalur, compared with control

S.No.	Place where the sample mg/g	Total Chlorophyll leaves were collected	Difference between content mg/g content and
1.	Allinagaram	1.0375	0.7760
2.	Eruthukaranpatti	1.4608	0.3527
3.	Thauthaikulam	1.0375	0.7760
4.	Manaleri	1.5920	0.2215
5.	Valajanagaram	0.9390	0.8745
6.	Kallankuruchi	1.0680	0.7455
7.	Control	1.8135	0.0000

Table 2

Values of Chlorophyll 'a' and Chlorophyll 'b'

S.No.	Place where the leaves were collected	Chlorophyll 'a' mg/g	Chlorophyll 'b' mg/g
1.	Allinagaram	0.4469	0.5910
2.	Eruthukaranpatti	0.6659	0.7950
3.	Thauthaikulam	0.4469	0.5910
4.	Manaleri	0.6140	0.9780
5.	Valajanagaram	0.4119	0.5270
6.	Kallankuruchi	0.4774	0.5900
7.	Control	0.7911	1.0230

Table 3

Percentage of Moisture content in neem leaves

S.No.	Place where the leaves were collected	Initial weight in gm	Final weight in gm	% of moisture content
1.	Allinagaram	2	0.720	64%
2.	Eruthukaranpatti	2	0.620	69%
3.	Thauthaikulam	2	0.750	63%
4.	Manaleri	2	0.760	62%
5.	Valajanagaram	2	0.680	66%
6.	Kallankuruchi	2	0.710	65%
7.	Control	2	0.480	76%

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