BIOPHYSICAL ASSESMENT OF SELECTED TREE SPECIES

IN THE URBAN CENTER OF ILOILO

A Research Paper
Presented to
The Faculty of Philippine Science High School Western Visayas
Bito-on, Jaro, Iloilo City

In Partial Fulfillment
Of the Requirements for
SCIENCE RESEARCH

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Fourth Year – Graviton

August 2003

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS

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ILOILO CITY

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ACKNOWLEDGEMENT

The researchers give thanks and praises to the persons whose valuable contributions made this research proposal possible. Profound gratitude and appreciation are due to the following:

The DENR-EMB and Forestry Division for their generous contributions of resources and knowledge.

Mr. AJ Eurybiades Salcedo, for helping us in the first half of the project as well continued support.

Mr. Marvin Cadornigara and Mr. Angelo Olvido for lending us the necessary data we need.

The children of the Amphitheatre for helping us in the compilation of field data.

Mrs. Josette Biyo for being patient with us and providing strong support for us to finish our project.

The Late Roben Calvo, for being an inspiration and a guiding force to pursue this research.

To our batch mates here in Philippine Science High School for giving us suggestions and comments to our work.

And our Parents for their never absent support and encouragement.

And over and above to Our Lord God

The Researchers

ABSTRACT

This study was conducted to determine the bioremedial effects of several tree species, namely Narra, Alibangbang, Gmelina, and Mango. These effects were recorded in terms of temperature difference between open and shaded area and dust removing capabilities of the leaves from the air. The study was done in a span of two months with the temperature difference in the first month and dust accumulation in the second. The results showed that the Mango is very suitable in lowering the temperature under the shade while the Alibangbang has the highest dust accumulation per leaf area. Gmelina also showed high in dust accumulation potential but ranked lowest in terms of dust accumulation per cm^2 leaf area. There was no significant difference in terms of dust accumulation per leaf area.

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CHAPTER 1

INTRODUCTION

A. Background of the Study

Air pollution is the addition of harmful substances to the atmosphere resulting in damage to the environment, human health, and quality of life. Air pollution occurs inside homes, schools, offices; in cities; across continents; and even globally. Air pollution makes people sick-it causes breathing problems and promotes cancer - and it harms plants, animals, and the ecosystem in which they live. Some air pollutants return to earth in the form of acid rain or snow, which corrode statues and buildings, damage crops and forests, and make lakes and streams unsuitable for fish and other plant and animal life. . ("Air Pollution," Microsoft® Encarta® Encyclopedia 99. © 1993-1998). Trees are living plants that 'breathe' to help them grow. As they breathe, they remove unwanted carbon dioxide from the air - a greenhouse gas that contributes to global warming - and replace it with life sustaining oxygen. (http://www.cwc.ca). Trees are silent sentinels which give important contributions to the improvement of the urban ecosystem such as modifying microclimate conditions, shading effect, increase long-wave radiation, reducing wind speed, intercepting rain, cooling the air by evapotranspiration and raising the humidity of air. (Conrado B. Marquez, Allen T. Escario, Neil G. Gigare; "Suitable Species for Iloilo Urban Ecosystem.")

B. Problem of the Study

This study aims to answer the following questions:

- Will there be a significant difference in temperature in areas under the shade of different tree species?
- Will there be a significant difference in dust particle accumulation in leaves of different tree species?
- Can the physical aspects of the tree affect dust particle accumulation and temperature difference between open area and shaded area?

C. Hypothesis of the Study

- There will be a significant difference in temperature in areas under the shade of different tree species.
- There will be a significant difference in dust particle accumulation in the leaves of different tree species.
- Physical aspects can affect the tree's properties in terms of dust particle accumulation and temperature difference between open area and shade.

D. Objectives of the Study

This study was conducted with the following objectives:

1. To determine whether there is a significant difference in percent temperature and percent dust particle accumulation on different tree species.
2. To compare percent temperature difference and percent dust particle accumulation of different tree species.

E. Significance of the Study

The significance of the study is to determine which tree specie shall greatly help in any given populace in terms of pollution control. It can also decrease costs in minimizing air pollution in urban centers. Knowing which specie can reduce dusts may help in reducing asthma or any dust related illness in a given populace. Knowing which tree can decrease temperature can reduce the over all temperature throughout the area. This assessment can guide city planners in making more parks that really benefit the populace.

F. Scope and Limitations

This study shall be done in a span of two months and in an urban park namely, the Amphitheatre. It shall only measure temperature and dust particle reduction. It will only measure the selected tree species namely Narra, Alibangbang, Mango and Gmelina.

G. Definition of Terms

- Pollution – In this study, pollution is generally applied as air pollution.
- Air pollutants – Any particle present in the atmosphere, where here it is applied being chemicals and dust.
- Microclimate – A climate in a very small area.
- Populace – The mass of common people given on an area.
- Tree -- A perennial woody plant usually a single-supporting trunk with branches and foliage growing at some distance above the ground.
- Urban area – A city area at this we refer to Iloilo city.
- Dust Particle Accumulation – Amount of dust accumulated on the leaves of any given tree specie.

CHAPTER II

REVIEW OF RELATED LITERATURE

Air pollution is the addition of harmful substances to the atmosphere resulting in damage to the environment, human health, and quality of life. One of the many forms of pollution, air pollution occurs inside homes, schools, offices; in cities; across continents; and even globally. Air pollution makes people sick-it causes breathing problems and promotes cancer - and it harms plants, animals, and the ecosystem in which they live. Some air pollutants return to earth in the form of acid rain or snow, which corrode statues and buildings, damage crops and forests, and make lakes and streams unsuitable for fish and other plant and animal life.

Pollution is changing the earth's temperature so that it lets in more harmful radiation from the sun. At the same time, our polluted atmosphere is becoming a better insulator, preventing heat from escaping back into space and leading to a rise in global average temperatures. Scientists predict that temperature increase, referred to as global warming, will affect world food supply, after sea level, make weather more extreme, and increase the spread of tropical disease.

Most air pollution comes from one human activity: burning fossil fuels - natural gas, coal, and oil - to power industrial processes and motor vehicles. Among the harmful chemical compounds this burning puts into the atmosphere are carbon dioxide, carbon monoxide, nitrogen oxides, sulfur dioxide, and tiny solid particles – including lead gasoline additives – called particulates. Between 1900 and 1970, motor vehicle use rapidly expanded, and emissions of nitrogen oxides, some of the most damaging pollutants in vehicle exhaust, increased 690 percent. When fuels are incompletely burned, various chemicals called volatile organic chemicals (VOCs) also enter the air. Pollution also comes from other sources. For instance, decomposing garbage in landfills and solid waste disposal sites emits methane gas, and many household products give off VOCs.

Some of these pollutants also come from natural sources. For example, forest fires emit particulates and VOCs into the atmosphere. Ultra fine dust particles, dislodged by soil erosion when water and weather loosen layers of soil, increase airborne particulate levels. Volcanoes spew out sulfur dioxide and large amounts of pulverized lava rock known as volcanic ash. A big volcanic eruption can darken the sky over a wide region and affect the earth's entire atmosphere. The 1991 eruption of Mount Pinatubo in the Philippines, for example, dumped enough volcanic ash into the upper atmosphere to lower global temperatures for the next two years. Unlike pollutants from human activity, however, naturally occurring pollutants tend to remain in the atmosphere for a short time and do not lead to permanent atmospheric change. Once in the atmosphere, pollutants often undergo chemical reactions that produce additional harmful compounds. Air pollution is subject to weather patterns that can trap it in valleys or blow it across the parks for instance, the air is supposed to remain as clean as it was when the law was passed. The act sets deadlines by which standards must be met. The Environmental Protection Agency (EPA) is in charge of refining and enforcing these standards, but the day-to-day work of fighting pollution falls to the state governments and to local air pollution control districts. Some states, notably California, have imposed tougher air pollution standards of their own.

In an effort to enforce pollution standards, pollution control authorities measure both the amounts of pollutants present in the atmosphere and the amounts entering it from certain sources. The usual approach is to sample the open, or ambient, air and test it for the presence of specified pollutants. The amount of each pollutant is counted in parts per million or, in some cases, milligrams or micrograms per cubic meter. To learn how much pollution is coming from specific sources, measurements are also taken at industrial smokestacks and automobile tailpipes.

Pollution is controlled in two ways: with end-of-the-pipe devices that capture pollutants already created, and by limiting the quantity of pollutants produced in the first place. End-of-the-pipe devices include catalytic converters in automobile and various kinds of filters and scrubbers in industrial plants. In a catalytic converter exhaust gases pass over small beads coated with metals that promote reactions changing harmful substances into less harmful ones. When end-of-the-pipe devices first began to be used, they dramatically reduced pollution at a relatively low cost. As air pollution standards become stricter, it becomes more and more expensive to further clean the air. In order to lower pollution overall, industrial polluters are sometimes allowed to make cooperative deals. For instance, a power company may fulfill its pollution control requirements by investing in pollution control at another plant or factory, when more effective pollution control can be accomplished at a lower cost.

End-of-the-pipe controls, however sophisticated, can only do so much. As pollution efforts evolve, keeping the air clean will depend much more on preventing pollution than on curing it. Gasoline, for instance, has been reformulated several times to achieve cleaner burning. Various manufacturing processes have been redesigned so that less waste is produced. Car manufacturers are experimenting with automobiles that run on electricity or on cleaner burning fuels. Buildings are being designed to take advantage of the sun in winter and shade and breezes in summer to reduce the need for artificial heating and cooling, which are usually powered by the burning of fossil fuels.

The choices people make in their daily lives can have a significant impact on the state of the air. Using public transportation instead of driving, for instance, reduces pollution by limiting the number of pollution-emitting automobiles on the road. During periods of particularly intense smog, pollution control authorities often urge people to avoid trips by car. To encourage transit use during bad-air periods, authorities in Paris, France, make bus and subway travel temporarily free.

Indoor pollution control must be accomplished building-by- building or even room-by-room. Proper ventilation mimics natural outdoor air currents, reducing levels of indoor air pollutants by continually circulating fresh air. After improving ventilation, the most effective single step is probably banning smoking in public rooms. Where asbestos has been used in insulation, it can be removed or sealed behind sheathes so that it won't be shredded and get into the air. Sealing foundations and installing special pipes and pumps can prevent radon from seeping into buildings.

On the global scale, pollution control standards are the result of complex negotiations among nations. Typically, developed countries, having already gone through a period of rapid (and dirty) industrialization, are ready to demand cleaner technologies. Less developed nations, hoping for rapid economic growth, are less enthusiastic about pollution controls. They seek lenient deadlines and financial help from developed counties to make expensive changes necessary to reduce pollutant emissions in their industrial processes.

Nonetheless, several important international accords have been reached. In 1988, the United States and 24 other nations agreed in the Long-Range Transboundary Air Pollution Agreement to hold their production of nitrogen oxides, a key contributor to acid rain, to current levels. In the Montreal Protocol, adopted in 1987 and strengthened in 1990 and 1992, most nations agreed to stop or reduce the manufacture of CFCs. In 1992 the United Nations Framework Convention on Climate Change negotiated a treaty outlining cooperative efforts to curb global warming. The treaty, which took effect in March 1994, has been legally accepted by 160 of the 165 participating countries.

In December 1997 at the Third Conference of the United Nations Framework Convention on Climate Change in Japan, more than 160 nations formally adopted the Kyoto Protocol. This agreement calls for industrialized nations to reduce their emissions of greenhouse to 5 percent below 1990 emission levels between 2008 and 2012. The United States, which releases more greenhouse gases than any other nation, has traditionally been slow to support such strong measures. The U.S Senate may be reluctant to ratify the Kyoto Protocol because it does not require developing countries, such as China and India, to meet similar emission goals.

All these antipollution measure have helped stem the increase of global pollution emission levels. Between 1970, when the Clean Air Act was passed, and 1995, total emissions of the major air pollutants in the United States decreased by nearly 30 percent. During the same 25-year period, the U.S. population increased 28 percent and vehicle miles traveled 116 percent. Air pollution control is a race between the reduction of pollution from each source, such as a factory or a car, and the rapid multiplication of sources. Smog in American cities is expected to increase again as the number of cars miles driven continue to rise. Meanwhile, developing countries are building their own industries, and their citizens are buying cars as soon as they can afford them. Ominous changes will continue in the global atmosphere. New efforts to control air pollution will be necessary as long as these trends continue. ("Air Pollution," Microsoft® Encarta® Encyclopedia 99. © 1993-1998)

Various pollutants require varied approach in its control. Dry control methods for the control of particulates include the use of gravity chambers, cyclones, bag filters, and electrostatic precipitators. These methods utilize the physical properties of the particulates, with gravitational, centrifugal, inertial, and/or electrical mechanisms to affect the separation (Master of Science in Environment Management 2001).

Wet control methods involve the use of wet scrubbers, surface area scrubbers and venturi scrubbers. They are used not only for control of particulate emission but also for removing certain gaseous emissions such as sulfur dioxide, acid, mists, and organic pollutants some of which may cause foul odors. In the design of scrubbers, the variation includes spray contact, impingement, surface area, cyclone, and venturi scrubbers (Master of Science in Environment Management 2001).

The control of pollutant sulfur dioxide can be done using three ways. Controlling or limiting the sulfur content of the fuel used. Removing the sulfur oxides from the gas and modifying and controlling the combustion process (fluidized bed combustion technologies).

Fuel-site technologies included use of low sulfur-fuels, fuel-oil desulphurization, coal cleaning and treatment, and coal gasification. FGD technologies include wet FGD processes, such as sodium-based dual alkali (DA) process and the regenerative magnesium oxide FGD process; the dry scrubbing process wherein in a dry alkaline powder is injected directly into the fuel gas stream.

Fluidized bed combustion technologies for sulfur removal are among the latest emerging pollution control technologies and these include atmospheric fluid bed combustion (AFBC), circulating fluid bed combustion (CFBC) and the pressurized fluid bed combustion (PFBC) (Master of Science in Environment Management 2001).

For the control and removal of pollutant Nitrogen oxides, several technologies are available or under development to control them, namely; low excess air combustion (LEA), staged combustion (SC), low NO burners (LNB), flu gas recirculation (FGR), reduced air preheat (RAP), load reduction (LR) or reduced combustion intensity, and ammonia injection or selective noncatalytic reduction.

In the LEA technique, the combustion is reduced to the minimum amount required for complete combustion, maintaining acceptable furnace cleanliness and steam temperature. Staged combustion seeks to control NO by carrying out initial combustion in a primary fuel-rich combustion zone, and then completing combustion at lower temperature is a second, fuel-lean zone. Low NO burners generally reduce flame turbulence, delay fuel-air mixing, and establish fuel-rich zones where combustion initially takes place. Flu-gas recirculation consists of extracting a portion of the flu gas and returning it to the furnace, admitting the flu gas through the burner wind box.

Ammonia injection technology selectively reduces NO to N and OHO with injection of ammonia (NH3) at flu-gas temperature ranging from 1070 to 1270 degrees Kelvin without a catalyst (Master of Science in Environment Management 2001).

Trees are living plants that 'breathe' to help them grow. As they breathe, they remove unwanted carbon dioxide from the air - a greenhouse gas that contributes to global warming - and replace it with life sustaining oxygen. (http://www.cwc.ca). Trees are silent sentinels which give important contributions to the improvement of the urban ecosystem such as modifying microclimate conditions, shading effect, increase long-wave radiation, reducing wind speed, intercepting rain, cooling the air by evapotranspiration and raising the humidity of air. (Conrado B. Marquez, Allen T. Escario, Neil G. Gigare; "Suitable Species for Iloilo Urban Ecosystem.")

Trees are valuable to humankind for many products and amenities. Many trees are major sources of food, primarily as fruit and nuts; also, sugar is derived from the sap of some trees. Wood is a major source of fuel for heating and cooking, particularly in developing countries. Construction materials from wood include lumber, plywood, and particleboard. Wood is a major source of fiber for the production of pulp and paper. Trees are a primary or secondary source for many chemicals products. Some fibers, such as Rayon, are produced from a wood pulp. The bark of some tree species is the major source of tannins. Other chemicals are harvested directly from living tree, such as rubber and various resins, which are then refined to such products as turpentine.

Trees also provide numerous services. They protect soil from erosion and help maintain high quality water supplies. Tree root systems make a major contribution to soil stability. Living trees create valuable wildlife habitats. Standing dead trees, often called snags, also serve as animal habitats. Drowned trees are important in conversing and cycling nutrients, in soil erosion, as wildlife habitats, and as nursing sites for the establishment of other plants. Trees create shelterbelts in agricultural regions and attractive and effective barriers in urban areas, and contribute aesthetically to many natural and domestic landscapes.

Plant species are considered highly resistant when after high exposure to high traffic density areas showed zero or almost zero percent injury and can grow well naturally. The following plant species include: adelfa, African tulip, bandera espanola, bougainvilla, bunga, caballero, campanilla, ipil-ipil, lumbang, mayana, molave, mollocan sau, pandan, San Francisco, tsitsirika, yellow bell, yemane and the zigzag plant. These species are also recommended for SO_2 and NO_2polluted areas (DENR-NCR 1994).

CHAPTER III

MATERIALS AND METHODS

A. MATERIALS:

- Thermometer (2)
- Tape Measure (2)
- Meter Stick (2)
- Filter Paper Plates (100)
- Analytical Balance
- Dessicator
- Oven Dryer
- Luxmeter

B. COLLECTION OF LEAF SAMPLES:

The study was conducted in an area based on increasing amounts of pollution, proximity to industrial centers and heavy traffic. This area is the Iloilo Amphitheatre.

Experimental trees were tested of their dust absorption capability. Four leaf samples from four sides of the crown were pre-washed and left to stand for 5-6 days, they were then collected and dust/particulates washed off with distilled water. Dust solutions were then filtered, oven-dried and weighed. The result represents the quantity of accumulated dust per unit leaf area and per unit time.

C. PHYSICAL CHARACTERISTICS

Height, diameter at breast, crown height and diameter, average leaf area and trunk height of each experimental tree have been measured and determined. Crown base diameter was measured by measuring tape around the trunk parallel to your chest. Height was measured by estimate using a measuring stick as a base. Trunk height is the subtracted from it to get the crown height. All height data were estimated. Average leaf area was supplied by getting three leaves from each tree and got their area.

D. TEMPERATURE

Collection of data has been done at noon for maximum sunlight and temperature changes. Temperature was noted in the ground under the trees' shade as well as the unshaded area to calculate temperature difference.

E. TABULATION OF DATA

Data were then tabulated based on their capabilities in the following; temperature change, dust absorption, pollution absorption, and light reduction. They have been placed in a highest to lowest order and are classified by their corresponding park.

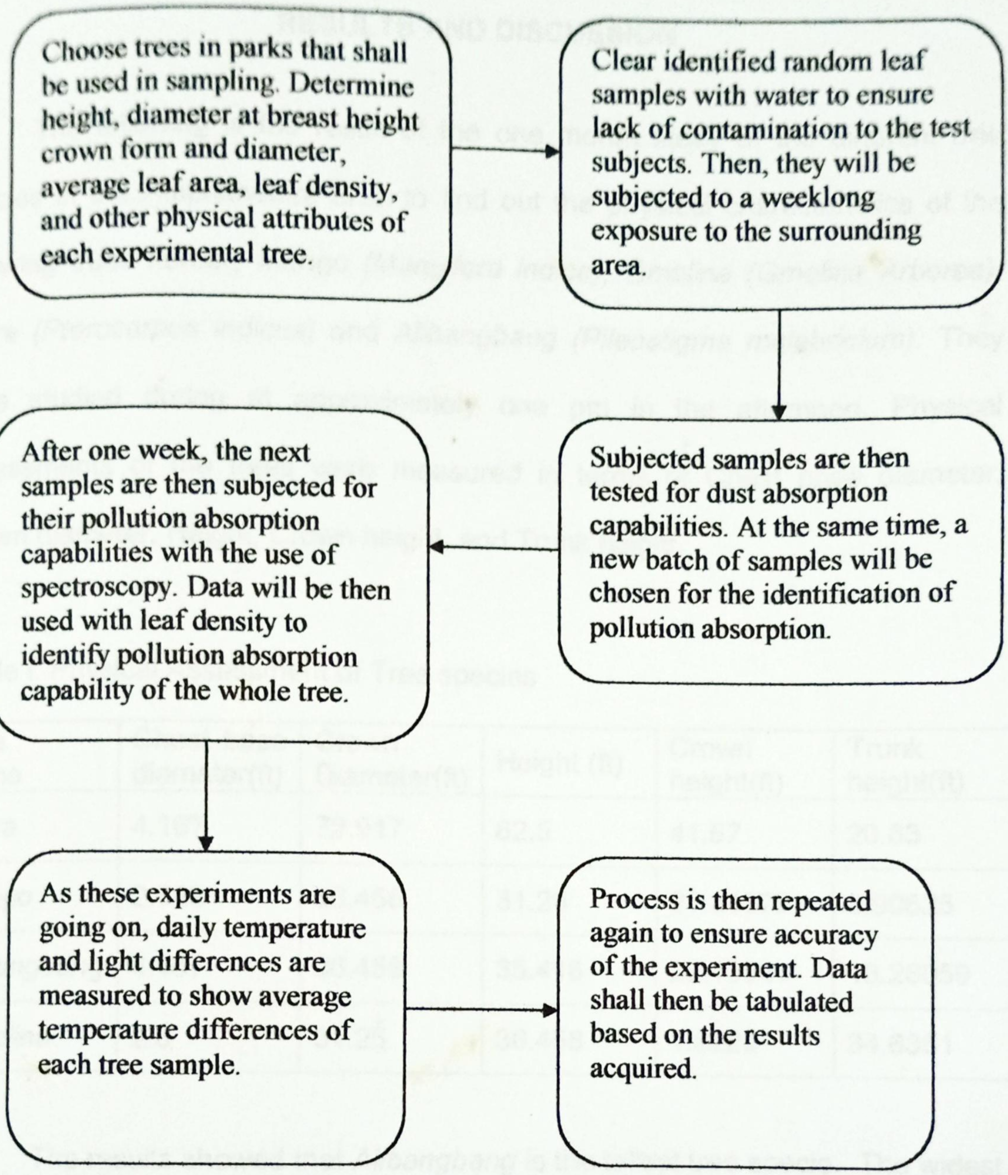

Fig. 1 Concept Map of the Methodology

CHAPTER IV

RESULTS AND DISCUSSION

The following is the result of the one month study of the different tree species in the Amphitheatre area to find out the physical characteristics of the following trees namely *Mango (Mangifera indica)*, *Gmelina (Gmelina Arborea)*, *Narra (Pterocarpus indicus)* and *Alibangbang (Pileostigma malabricium)*. They were studied during at approximately one pm in the afternoon. Physical assessments of the trees were measured in terms of Chest base diameter, Crown diameter, Height, Crown height, and Trunk height.

Table I. Physical Assessment of Tree species

Tree Name	Chest base diameter(ft)	Crown Diameter(ft)	Height (ft)	Crown height(ft)	Trunk height(ft)
Narra	4.167	72.917	62.5	41.67	20.83
Mango	2.083	36.458	31.25	27.34375	3.90625
Alibangbang	4.167	36.458	35.416	22.13541	13.28059
Gmelina	2.5	31.25	36.458	1.8229	34.6351

The results showed that *Alibangbang* is the tallest tree specie. The widest in diameter is the *Narra* tree. The shortest tree on the other hand is the *Gmelina*. The results here can imply if that the general physical characteristics of the tree can help in its temperature control as well as its dust absorbing capabilities.

Table II. Base temperature of tree species

Tree Name	July 28, 2003	August 2, 2003	August 3, 2003	August 9, 2003	August 10, 2003	August 16, 2003	August 17, 2003	August 23, 2003	Ave. Temperature
Narra	28.0	29.0	27.9	28.0	28.0	28.5	29.0	28.5	25.21
Mango	27.5	26.0	27.0	26.5	26.0	27.0	27.0	26.0	23.67
Alibangbang	27.1	28.5	25.0	27.5	25.0	28.1	28.5	28.0	24.81
Gmelina	28.0	27.0	27.0	27.0	27.5	28.0	28.0	27.0	24.38

Table III. Dust Particle Accumulation per cm^2.

Tree Name	Ave. Dust Particle Accumulation	Ave. Leaf Area (cm)	Dust particle per leaf area
Narra	0.010625	76.50	.00013889
Mango	0.0101	83.92	.00012035
Alibangbang	0.02095	106.65	.00019644
Gmelina	0.010825	117.075	.00009246

Table 2 records the temperature measured on the foot of the given trees in a span of one month. They were recorded twice a week during Saturdays and Sundays at approximately one pm. Temperature was measured in degree Celsius.

The table showed that the *Mango* leads among the rest of the trees in terms of lowering temperature under the shade. This may be due to the shortness of its structure thereby maximizing the cooling effect of its shadow on the ground. Ground temperature within the vicinity *Alibangbang* and *Narra* tree, were higher at 24.81° and 25.21° Celsius respectively. Ground temperature within the vicinity of *Gmelina* was 24.38°. Though slightly taller than the Mango, it complements this by its broad leaves rating it just slightly higher than the latter.

Dust particle accumulations of the leaves are in grams/cm^2. They were extracted after being left out for a week for it to collect dust from the local traffic.

Table 3 records the amount of dust accumulated by the tree in its leaves. It was measured in grams/cm².

The results show that the tree, *Alibangbang* has lots of particle. It can be assumed that the dust collected were from a garbage that was burned under the base of its trunk. The second, *Gmelina* may seem reasonable as its large leaf area can help it extract the dust in the atmosphere. Also it is situated near the loading and unloading area for PUJs causing it to be exposed to lots of dusts and pollution.

The dust particle accumulated was also tabulated in contrast to average leaf area to get the amount of dust per square cm. of the given tree specie. Table III records the results. *Alibangbang* has the highest amount of dust collected per cm². Although *Gmelina* was the second in dust accumulation, it was last in terms of dust collected per cm². Although *Narra* has a smaller leaf area than *Mango*, it was better at collecting dust per cm².

Statistical analysis using Oneway Anova of Dust Particle Accumulation vs. Tree species showed that there was no significant difference in terms of Dust Particle Accumulation per Leaf Area.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

- *Mango* should be used for areas that are needed to be shaded and cool. It is advisable to put in urban areas were hot weather is frequent.
- *Alibangbang* are very useful in areas were dust are readily blown by wind. It should be planted in parks that are near major traffic areas.
- Height and crown diameter have effects to the temperature change around different tree species. Hence the shorter a tree, the cooler is its shade.
- Large leaved trees can collect high amounts of dust and height does not affect the amount of dust accumulation.
- There is no significant difference in terms of dust particle accumulation per cm^2.

RECCOMENDATION

We recommend that:

- Other experiments should be done to other parks as well as other tree species.
- The amount of sunlight screened by the tree should also be measured.
- Leaf samples for dust accumulation capability must be collected at uniform levels.
- Leaves should be tested to measure any pollutants that it has absorbed.
- Establish a pollution free site as control.
- Age of the trees should be all equal to limit pollution resistance and development of the tree species.

REFERENCES:

- Prof. Rafael Rueda; Master of Science in Environmental Management 2001
- DENR-EMB 1979
- US ENVIRONMENTAL PROTECTION AGENCY(EPA)
- Grolier International Encyclopedia
- Richard J. Ordway; Earth Science and Environment
- Jonah M. Sumabon, Chona M. Tura; Biophysical Assessment of Existing Tree Specie in the Urban Centers of Cebu, Ecosystems Digest
- Conrado B. Marquez, Allen T. Escario, Neil G. Gigare; "Suitable Species for Iloilo Urban Ecosystem.