

Junior College Division Winner - Hwa Chong Institution (College)



*Airspora Investigative Research Force (A.I.R. Force)
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A study of atmospheric frequency of airspora with meteorological conditions in the school community

Background information

Singapore, with its tropical climate, has a vast variety of plants and flora. Rainfall and humidity are high annually, with most of the precipitation experienced during the months of November to February. Wind speeds however, are known to be rather low, although stronger in the rainy season. Temperature remains rather consistent throughout the year and seldom falls out of the range of 26°C-33°C.

This vast abundance of flora in Singapore comes at a cost – many Singaporeans suffer from incidents of skin allergy due to pollen and fern spores. In a recent study done by Chew et al. (2000), a high frequency of positive reactions in atopics to airspora ranging from 27.7-33.8% for pollen, and 20.3-34.2% to fern spores was found. Regionally, neighbouring countries like Malaysia showed rates of 23.3-29.5% for pollen sensitization. Globally, there have also been reports on the effects of airspora on humans. The percentage of people allergic to pollen in Spain was reported to be 29.8-33% in Spain (Carinanos et al., 2002; Armentia et al., 1991) and a shocking 40.4% in Greece!! (Gioulekas et al., 2004) All these data translate into monetary losses and periods of distress for allergy patients of the world today.

Fortunately, this has spurred some, albeit limited research to be done in the world. However, much of the work done on the effect of climate are limited in scope and goes some years back in time, resulting in inaccuracy since airspora composition is constantly being affected by the dynamic botany of the world. Climatic changes also contributes to inaccuracy as the changing temperatures, humidity, carbon dioxide levels etc might alter the flowering and sporulating characteristics of plants and fern alike. In addition, little research has been done in Asia-pacific regions on the effect of meteorological variables on airspora composition. Therefore, this inspired us on a quest to capture and identify the airspora compositions that exist within the school confines and relate their frequency to the meteorological conditions.



Summary of our Project

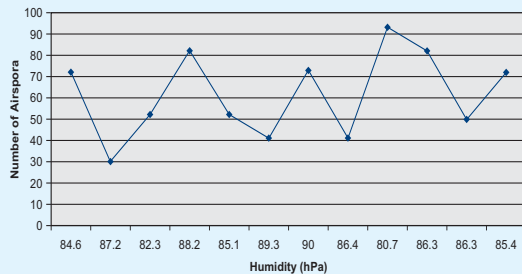
Our study involved the use of the Durham trap to obtain sample collections of airborne pollen and fern spores from the school, specifically from the tennis courts and rooftop. Thereafter we proceeded to use meteorological data from the weather station in our school to draw correlations to airspora counts. Through statistical analysis and correlation data, we have established some interesting trends as discussed in our written report. Due to the relatively short period of sampling and to increase accuracy and scope of discussion, conscious cross-references were made to various available scientific reports. It is hoped that the findings from this study will provide useful information on the sources of allergen [airspora] in local, regional and even global allergy studies.





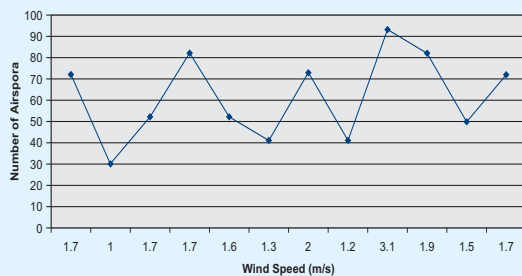
Brief Overview of our Results

Graph Showing Variance of Number of Airspora with Humidity



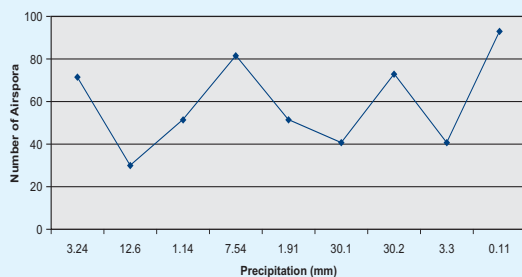
- As seen from the results obtained, there were no clear relations obtained between relative humidity and total airspora count.
- However, zooming in on airspora composition, when other meteorological factors are constant, it is noted that with higher humidity, there is generally a higher fern spore count.

Graph Showing Variance of Number of Airspora with Wind Speed



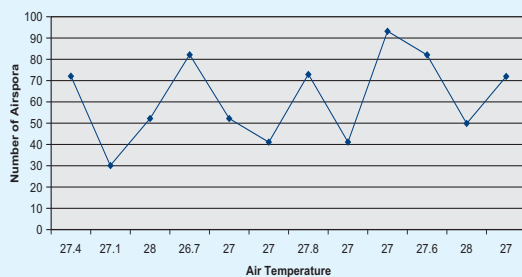
- Graph suggests that there is a direct relationship between wind speeds and the amount of airspora collected.
- Statistical tests also showed strong, positive correlation

Variation of Number of Airspora with Precipitation



- There seems to be no direct relationship between the amount of precipitation and the amount of airspora collected.
- Based on statistical test and scientific report, precipitation is insignificant in affecting airspora composition.

Graph Showing Variance of Number of Airspora with Temperature



- From graph, there is no significant variation in air temperature in the weekly data, thus we were unable to draw any statistical conclusions.
- Some scientific reports suggest that diurnal temperature and total airspora count is positively correlated.

Benefits of our Project

With these data obtained as a platform, we have come up with some potential applications and uses for the project. Having a better knowledge of airspora trends in the environment would allow doctors to use meteorological data to better advise patients on the prevention of allergy outbreaks (eg. patients should avoid staying outdoors on a particular kind of weather). Also, there are financial savings and treatment is made easier, since the potential cause of allergy cases can be identified in a shorter period of time. In addition, the team has successfully designed a website and came out with a database so as to showcase what we envision for our future findings and research.

A.I.R Force sincerely hopes that the project will excite you as much as it has intrigued us. It is our firm belief that this project is one for the present, as well as for the future.



Junior College Division 1st Runner-Up - Yishun Junior College



*Cheryl Phua, Marissa Tan,
Terry Tan and Sarah Varghees*

Happy hours in sunny Singapore

Our project idea was conceived out of a curiosity held by our group members, which was how Singaporeans always loved to idle at coffee shops drinking beer or coffee despite the stifling afternoon heat. This seems to defy popular conceptions that people would rather stay home in such uncomfortable humid weather! Thus, our wonder turned into a quest to discover if there was any truth to this belief of ours, that what Singaporeans choose to drink is inadvertently decided by the weather.



Weatherhawk machine near Al Fresco dining tables

“Happy Hours in Sunny Singapore” aims to investigate the effect of weather conditions on consumer preference for diuretic containing beverages, e.g. wine, beer, tea and coffee. Alcoholic or caffeinated beverages when consumed even in minimal amounts affect our bodily comfort level adversely as they can cause our bodies to dehydrate more rapidly than usual. Therefore we believe that the side effects borne out of consuming diuretic drinks will subconsciously affect future purchases of such drinks, especially when exposed to weather elements displeasing to the individual.

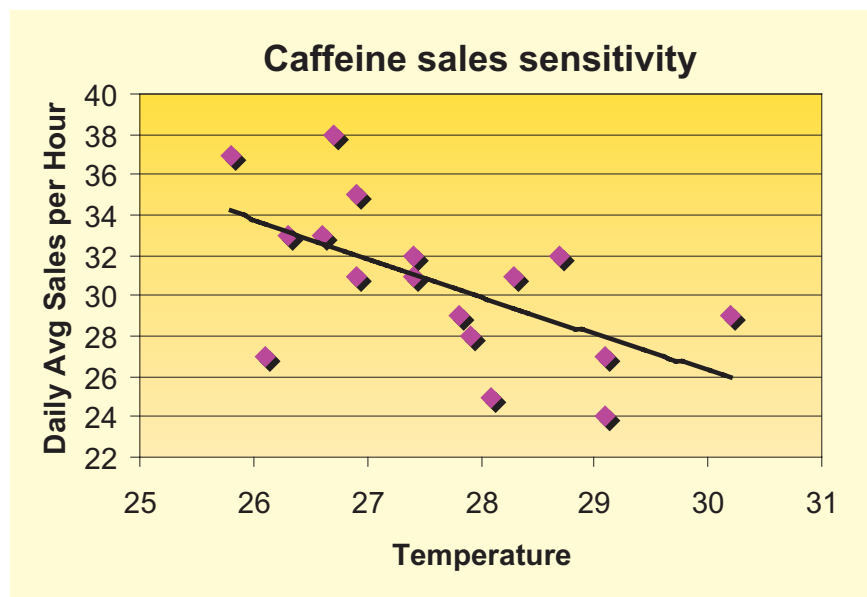
Singapore has a multitude of pubs and cafes, many of which feature alfresco seating arrangements. We have identified seven such beverage outlets in three prime locations for our study, Orchard Road, Boat Quay, and Holland Village. With the usage of the portable Weatherhawk device, our research team recorded the microclimate data of these places close to the beverage outlets. Changes in air temperature, barometric pressure, relative humidity and solar radiation are compared to the variable daily sales figures for each type of beverages for any patterns and trends.

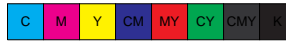


To study the relationship between consumer preference for alcoholic or caffeinated beverages and the weather possesses significant meaning. This is especially so for F&B businesses operating in a tropical environment. With the knowledge of the extent to which weather impacts the decisions their customers make, sales managers can better plan their businesses by factoring in anticipated changes in the weather.

For this purpose, we developed a mathematical index to calculate the propensity that demand for a beverage will change given a change in the weather. We coined the term "Weather Elasticity Index", which is useful for businesses to understand how dependent their products are on the weather. Weather elasticities for different products vary

widely and sales for some beverages can increase or decrease as much as 200-250 percent over finite period, even though there were relatively small changes in weather conditions.





Junior College Division Meritorious Submission - Millennia Institute



*Khairiyah Bte Mohammed Zez,
Teo Jia Li, Lum Wai Seng Dave Junia,
Siti Fathanah Bte Jailani,
Sangeetha Annadoray*

For a more user-friendly school compound

“Eh! The library is always packed with students, the canteen too noisy, the classroom is too constrictive, the picnic and pond areas are too hot! Its totally not conducive and comfortable to study there,” quipped Ana the ‘complain queen’ one day.

“Where shall we go then?” asked Riyah.

“Couldn’t we do something to improve these areas so that it will be more comfortable & conducive for us to study?” asked Jiali.

Suchlike concerns gave rise to the team’s objectives for this project, which are:

1. to discover how various school facilities mitigate inclement weather conditions
2. to understand the effectiveness of these facilities in enhancing student activities in school
3. to give suggestions of features and modifications that can be made to current locations to improve/ make them more popular.

Through observations of their general surroundings and some reading of relevant literature, the team noted that the equatorial climate of Singapore, with its high temperatures and high humidity, caused many Singaporeans to shun outdoor spaces and to depend heavily on artificial means of regulating their environment like air-conditioning.



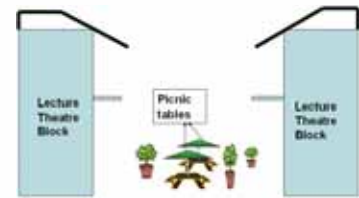
Yet, architects working with buildings in the tropics understand that there are ways to adapt to such a climate through more organic and environmentally responsible means.

The team endeavoured to approach the issue with the welfare of their peers in mind. Noting that there were several locations in the school compound that were intended for students’ use in their free time, the team selected five key areas to observe the microclimatic parameters, namely, temperature and humidity, and to see if there is a correlation between the microclimate, comfort level and the popularity of the areas.



Through comparisons of the climatic parameters of each area with the general climatic conditions of the school locality collected via an outdoor weather station, the team found that two of the locations, the waiting area near the pond and the picnic tables between the lecture theatre blocks had cooler conditions than the general conditions of the locale while maintaining a comfortable level of humidity. They attributed this to the beneficial effects of vegetation and shade in regulating the microclimate in a positive way.

Yet, through survey data and human traffic counts, the team also found that the areas are not being utilized very much. The team thus proposed some structural modifications to further improve the climatic condition of these areas.



As shown in figure 2, the modifications entailed the use of strategic plantings of dense vegetation around the picnic tables as well as the replacement of the current plastic parasols with fiberglass shelters fixed with photovoltaic solar panels that can power a small wall fan under the shelter itself. The benefits are namely:

- maintenance of humidity and shade by shrubbery which also act as noise buffers
- greater area shaded and sheltered from rain while light is maintained
- solar powered means of lowering temperatures and maintaining ventilation

The modifications are simple and mobile, which increases its applicability to a variety of locations and situations. As global warming continues to be a worrying issue, more environmentally conscious means of overcoming the tropical heat should be discovered. Rather than depending on air-conditioning which contributes to the greenhouse effect through the release of chlorofluorocarbons, more sustainable means of regulating our microclimates might yet be found with what we already have.

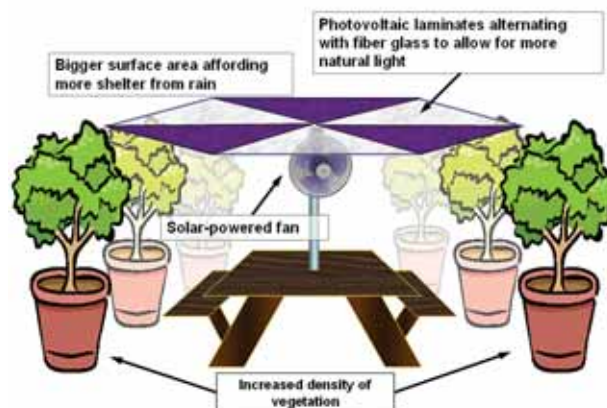


Figure 2: Suggested modification