Science Investigations

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விஞ்ஞான ஆய்வுகள்

NUMBER 4

DECEMBER 1988

RESEARCH IS THE FOUNDATION OF KNOWLEDGE

Published by
THE NATURAL RESOURCES, ENERGY AND SCIENCE AUTHORITY OF SRI LANKA

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SIMPLE INVESTIGATIONS IN SCIENCE

Edited by
V. Basnayake

CONTENTS

CONTENTS, CONT.

INTRODUCTION

The purpose of the present work is to offer some suggestions for pieces of simple but original investigations in science. It is addressed to students and teachers in secondary schools and to anybody else who would welcome some ideas for science project work in Sri Lanka. It was prepared under the auspices of the Working Committee on Science Education of the Natural Resources, Energy & Science Authority of Sri Lanka (NARESA).

The booklet consists of 19 pieces in the areas of botany (4 topics), chemistry (2), human physiology (7), sociology (1) and zoology (5). Each piece consists of an introduction (background) to the problem; a description of the method that could be used to solve the problem; a statement on how the results might be set out; and one or more references to the scientific literature on the subject.

Each piece has been written by a teacher from the school system or university system in Sri Lanka. His/Her name and address are given at the end of the piece. The main purpose of doing so is to enable the user of the booklet to get in touch with the author if necessary, e.g. to get clarification about materials and methods, or information as to where the scientific literature may be found for purposes of reference.

The language used here is English. It is hoped to prepare in due course a translation into Sinhala and Tamil. It is also hoped that the booklet will be the first of a small series of booklets of the same kind.

The editor would be pleased to receive suggestions from users of the booklet so that the quality of forthcoming work may be improved.

He would also welcome any scientific paper that a person who has worked on the projects described in the booklet, or any other original science project, for possible publication in NARESA's journal **Science Investigations.**

Professor V. Basnayake.
Editor

December 1988.

DURATION OF BLOOMING OF FLOWERS

Dr. V Basnayake*

BACKGROUND

There is little readily available information on the duration of blooming of different species of flowers. Textbooks of general botany deal with the development of the flower but say nothing about the withering of flowers. Even specialist works on flowering plants show the same omission. Thus the detailed descriptions of, say, the numerous species of *Ipomoea* (which include the morning glory, sweet potato and kankun) found in monographs on the flora of Lanka[1] or on medicinal plants[2] make no mention of the duration of blooming of their flowers. This is so even in works on the physiology of flowering[3,4] or on plant movements[5], with rare exceptions[6].

The duration of blooming, i.e. from the opening out of the petals to the closing of the petals, or to the wilting of the flower in the case of flowers that show no closing of the petals, has been measured in a few species of flowers in Lanka. It is one hour for *Elephantopus scaber* (Sinhalese, Ath adi)[7], about 6 hours for the Twelve O'Clock Flower (*Turnera ulmifolia)* which opens one hour after dawn and closes at noon[8]. It is about 24 hours for the gata pichcha species of jasmine (*Jasminum sambac*), about 32 h for the saman pichcha jasmine (*Jasminum humile*) and about 36 h for the pagoda flower (*Clerodendron paniculatum,* S. pinna)[9]. The flower of *Argyreia populifolia* (S. giritilla) lasts no more than a day[10]. The purpose of the present investigation is to estimate the duration of blooming, i.e. from opening to closing or withering, in the case of as many different plants as you can manage to study. By 'opening' of the flower is meant, for the present purpose, the opening out of the petals of an already fully grown flower bud to a fully open position. By 'closing' of the flower is meant a curling back of the tips of the petals so as to close off the inside of the flower (stamens and pistil), as happens in the afternoon in the case of the morning glory flower, often with a change of colour of the flower (from blue to pink in the case of the morning glory). By 'withering' (without closing) is meant a collapse of the flower without a systematic curling back of the petals, as in the case of the shoeflower.

METHOD

Flower opening. Observe the opening of the flower, i.e. the change from fully grown bud to the fully open flower. Note the time taken to open, and the time at which the flower is fully open.

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* Professor of Physiology, Faculty of Medicine, Peradeniya.

Flower closing or withering. Mark the flower (flower A) by attaching a thread to the flower stalk or by placing a drop of paint on it. Do so, wherever possible, next to another flower (flower B) on the same plant, so that B serves to check whether the process of marking A had any disturbing effect on the measurements to be made. Observe the flower at regular intervals of time. Note the time at which closing of the flower starts to occur, or the time at which distinct withering sets in.

RESULTS could be tabulated as suggested in the table below.

At collection of data:

Species of plant	*Plant no.*	*Flower no.*	*Date and time of flower*		*Bloom period*
			opening	*closing or withering*	
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6) = (5) – (4)*

Later re-tabulation of the data could be as follows:

Table 1. Flower blooming period (duration of time from the opening of the flower to closing or withering). Mean values and standard deviations.

Species		*Time of day at which the flower*			*Bloom period*
Botanical name	*Common name*	*opens*	*closes*	*withers*	

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RELATIONSHIP BETWEEN RIPENING OF FRUITS AND TEMPERATURE

D. M. A. Devasinghe*

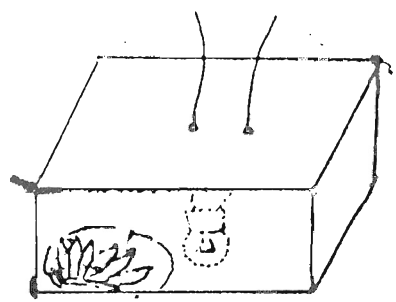
Background: To accelerate the ripening of fruits, specially bananas the village folk use various simple methods. Among these fumigating in a closed cabin under earth keeping bananas inside gunnybags, is common. These methods cause a rise in temperature of the fruit.

In contrast, if bananas or other fruits are kept in a refrigerator it tends to retard the ripening process. These observations indicate that temperature has an effect on the ripening of fruits.

The purpose of this investigation is to confirm whether there is such a relationship. For easy handling the fruit selected is the banana which is commonly found in any part of Sri Lanka.

Bananas are of various types . Some show a distinct colour change in ripening while some do not. For this investigation the bananas which change colour from green to yellow (eg. Embul, Kolikuttu - Sinhala) should be chosen.

Suggested procedure : Select a bunch of banana of a variety mentioned earlier. The banana bunch should be one which is about to ripen. Select the first two tiers of the bunch and name it A and B. Select about 2 or 3 fruits from each of A and B and label them. Place these in a polythene bag. In the same way make two other bags. Label the bags 1, 2 and 3. Keep bag 1 in a refrigerator, bag 2 at room temperature, and bag 3 in a closed card board box into which a lighted 20 watt electric bulb is inserted (See diagram).



* Regional Department of Education, Kurunegala.

Measure temperature of the surrounding air near the fruit in samples 1, 2 and 3 about every 12 hours. Watch for the appearance of yellow colour in the fruits. Also note whether it is A or B which turns yellow first. Continue till at least yellow colour appears in two of the samples 1, 2 and 3.

Repeat the experiment two or three times to make more sure of the result.

Suggestion for presentation of results:

Note down the results as shown in Table 1 and Table 2.

Table 1 — Measurement of temperature

Time in 12 hour units	*Temperature (°C)*		
	Sample 1	*Sample 2*	*Sample 3*
1			
2			
3			
4			
•			
•			
x			
Mean temp.			

Table 2 — Temperature and duration in ripening

Date of Start (x) : .....

Sample	*Mean temp. (°C)*	*Tier*	*Date of 1st appearance of yellow colour (y)*	*Time duration for ripening (x - y) days*
1		A		
		B		
2		A		
		B		
3		A		
		B		

Reference

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DISTINGUISHING BETWEEN PLANTS WHOSE LEAVES TURN BROWN WHEN BOILED IN WATER AND THOSE THAT REMAIN GREEN

E.T. Mahindadasa*

Background. Some leaves when boiled in water turn brown in colour while others remain green. Those which turn brown are not suitable for the starch test for photosynthetic activity.

Suggested procedure. Boil leaves of different plants in water for ten minutes. Remove the leaves from the vessel and spread them over a plain glass sheet. Note the change in colour of the leaves.

Results could be tabulated as follows.

Name of plant	*Colour of leaf*	
	original	*after boiling*

* 'Kurulukele', Field Study Centre, Kegalu M. V., Kegalle.

EFFECT OF LIGHT ON SLEEP MOVEMENTS IN LEAVES

D.M.A. Devasinghe *

Background: Light is the main source of energy which controls most of the activities of plants. It is observed that some plants in our environment close their leaves in the night and open up during day. (eg. *Mimosa pudica,* — Nidikumba, *Tamarindus indicus* — Siyambala, *Cassia tora,* — Peti tora, *Sesbania grandiflora* — Kathurumurunga). It is not known whether all these leaves take the same time duration to open up when light falls on them.

The purpose of this investigation is to estimate the time taken by a few plants of the above type to open up their leaves in sunlight. All the types of leaves under investigation are leguminous plants. The leaves are compound in nature and 'closing' of the leaves means that the leaflets are close together. 'Open', means that the leaflet blades are in the fully separated out position that is found in the plant.

Suggested procedure: Two or three plants, each from one species should be selected and grown in pots or polythene bags, After a few days of watering when the plants are in good condition, the investigation should be carried out.

Prepare cardboard boxes of a size that 'can' fully 'cover' each of the pots in polythene bags. The pots or bags with the plants are placed where sunlight is freely available without shading by any object.

Each box should now be placed so as to cover the entire plant and the pot. The plants should be labelled (A, B, C, ... etc). They should be covered during night and left over till the following day. When sunlight has fallen well over the area remove all the boxes at the same time. Note the time and watch for the opening of the leaves. Note the time duration taken to open by the leaves of each plant.

Suggestion for presentation of results:—
Record the results as shown in Table 1. Repeat the experiment for a few days and take the mean as shown in Table 2.

Special Notes:—
* Plants like Mimosa pudica which closes up its leaves when touched should be handled with much care. In removing the boxes the leaves may close if disturbed.

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* Regional Department of Education, Kurunegala.

TABLE 1 Recording the results for leaf opening

Date: .....

Name of plant	*Starting time of exposure to sunlight (1)*	*Time of full opening of leaves (2)*	*Time duration for the opening of leaves (3) = (2) – (1)*
A			
B			
C			
D			

TABLE 2 Period of exposure to sunlight required for leaves to open

Name of Plant	*Time duration for the opening of leaves*					*Mean time taken for the opening of leaves*
	Day 1	*Day 2*	*Day 3*	*Day 4*	*Day 5*	
A						
B						
C						
D						

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AN INVESTIGATION OF THE EXTENT OF WATER POLLUTION IN A LOCAL RIVER OR CANAL

R.S. Ramakrishna*

BACKGROUND: Waste water from factories and sewage works often enter a major local river. It is important that river life is kept alive and unwanted impurities are not in the water.

It is known that the amount of dissolved oxygen decreases with increase of temperature. Dissolved oxygen is used when bacteria in water turn ammonium compounds entering the river from sewage works and factories into nitrites and nitrates. A fast flowing river can dissolve oxygen from the air to replace any lost by pollution.

Other parameters of importance to water quality are pH—tendency for acidity and alkalinity, total dissolved solids (TDS) and biochemical oxygen demand (B.O.D.). The latter gives an indication of the amount of dissolved oxygen needed for bacteria to break down organic waste material in natural water.

SUGGESTED PROBLEMS:

(1) How does the amount of dissolved oxygen vary with the temperature of the water? Investigate the effect of temperature drop at night combined with the absence of photosynthesis.

(2) Investigate the amount of dissolved oxygen in fast flowing and stagnant water.

(3) Variation of the amount of dissolved oxygen, TDS, pH etc. with the type of vessel used for sampling (glass, plastic, metal etc.)

(4) Relationship between $\log_{10}[O_2]$ and $\log_{10}[Cl^-]$

The purpose of the project is a study of any two of the above problems. Improvement of technique of water sampling and effect of the number of samples on accuracy are beyond the scope of the project.

This project is suitable for investigation by a group of students.

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* Professor, Department of Chemistry, University of Colombo.

SUGGESTED PROCEDURE: Collect about 1 litre of water. The sample should be filtered using any filtering device, immediately after collection. The parameters to be determined all use simple volumetric methods. The temperature of the sample must be recorded at time of sampling. Analysis should be carried out within 24 hours of sampling. If analysis needs to be delayed, the filtered samples should be kept in a refrigerator.

Dissolved oxygen is determined using the Winkler method (1).

Total dissolved solids is determined by evaporation (2).

Note the temperature of the water at the time of sampling. Use different vessels for sampling such as glass bottles, plastic bottles, metal cans etc. and investigate the variation of the parameters you determine such as TDS, dissolved oxygen, pH etc. with the material of the vessel used for sampling.

The results should be tabulated to include point of sampling, sample number, TDS, dissolved oxygen, pH, type of sampling container, etc.

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VARIATION OF SOME QUALITY PARAMETERS OF GINGELLY SEED AND OIL (*Sesamum indicum*) WITH VARIETIES OR FORMS.

R.S. Ramakrishna*

BACKGROUND: Parameters that determine quality of edible oils include 'moisture content', 'acid value', 'saponification value', 'iodine value' etc. These can often be determined by simple procedures. There is however, little or no information on the variation of these parameters with moisture content of seed and acid value or free fatty acids (FFA) of the oils (1). One such seed is 'gingelly', popular for its edible oil and grown in the dry zones of Sri Lanka such as Jaffna, Anuradhapura and Polonnaruwa (2).

The purpose of this project is to relate some easily determined quality parameters of market samples of gingelly oil with respect to its source, variety or form, milling procedures, etc. The moisture content of the seed and the FFA content of the oil, could be easily determined in a school laboratory.

SUGGESTED APPROACH: Visit some of the oil mills in your area that extract oil from gingelly seed and sample about 25 g of seed and 100 cm^3 of the refined oil from each variety or form of seed used in the mill. Determine the moisture content of the seed and the FFA content of oil which is usually calculated as oleic acid (3, 4).

SUGGESTED PROBLEMS:

i. Relate the % FFA of oil, to the moisture content of the seed used to extract the oil.

ii. Investigate the variation of % FFA, to the variety or form used to extract the oil.

iii. Note the form or variety of the gingelly seed used for oil and the colour of the oil sampled (light, brown, yellow, dark brown, straw colour etc.)

iv. Oils with low % FFA are commonly graded as being of high quality. Acceptable legal standard for % FFA is 2.5 (max.). You should be able to grade the oils on the basis of the values obtained for % FFA.

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* Professor, Department of Chemistry, University of Colombo.

PRESENTATION OF RESULTS: The results could be noted down in a table to include sample no., source of sampling, variety or form of gingelly seed, moisture content, % FFA as oleic acid and summarised in another table.

POSSIBLE PITFALLS: Some of the marketed samples are adulterated with saturated oils. Avoid using such samples. A simple test for unsaturation is that such oil will not freeze, when kept in a deep freezer or a freezing compartment of refrigerator. Sample of seed & oil should be 'representative' of the bulk and not taken off any vessel or container.

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A STUDY OF THE RATE OF FLOW OF RESTING AND STIMULATED SALIVA.

M. Udupihille*

Introduction

The flow of saliva can be stimulated by several factors. They include chewing of food, exposure to the sight of food and the smell of food being prepared. This increase in rate of salivary flow is brought about by reflexes arising within the oral cavity as well as conditioned reflexes.

Materials:— beakers, weighing balance.

Method:— 1. The subject may keep the mouth open and allow the saliva collected to drip into a beaker held below the mouth.

2. Or, the subject keeps the mouth closed and spits into a beaker at regular intervals. This method is more convenient from the point of view of the subject.

Resting saliva is collected for 10 minutes. The subject should not talk or perform chewing movements.

Stimulated saliva is collected by the same procedure. Food is prepared in the presence of the subjects who gets exposed to the aroma of the foods. Best results in our experience has been obtained by dried fish and onions mixed with chillie powder and fried in coconut oil.

The weight of saliva is determined by weighing the beakers empty and with collected saliva.

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* Dr (Mrs) M. Udupihille, Dept. of Physiology, Faculty of Medicine, Peradeniya.

Results: May be tabulated as follows:

	Resting saliva			*Stimulated saliva*		
Subject	*Weight of beaker*	*Weight of beaker + saliva*	*Weight of saliva*	*Weight of beaker*	*Weight of beaker + saliva*	*Weight of saliva*
1	*2*	*3*	*4*	*5*	*6*	*7*

Analysis: Means and standard deviations for columns 4 and 7 to be determined. Significance of the differences between the two groups of results may be detemined by the Student 't' test.

TRANSIT TIME OF SRI LANKAN FOODS IN THE ALIMENTARY CANAL FROM MOUTH TO THE CAECUM.

C. Goonaratna*

Background: Practically no information is available regarding the transit time for Sri Lankan foods like curry and rice, string-hoppers, pittoo etc in the alimentary canal from the mouth to the caecum.

Suggested methods:

1. Methods involving Xray pictures
2. Methods involving 'markers' like coloured small glass beads, which may be swallwed.
3. Measuring gaseous hydrogen in expired air.

(Question: What are the advantages of the last method over the other methods?)

When carbohydrate residues of a meal enter the caecum, bacteria in the large gut break down these residues, liberating gaseous hydrogen within a few minutes. Most of this hydrogen is exhaled in the breath. The content of hydrogen in exhaled air can be simply, safely and accurately measured using a special instrument called a hydrogen monitor. Accuracy of measurement is about I part per million. A sudden peak of serial breath hydrogen measurements signals entry of carbohydrate residues of a meal into the caecum.

Presentation of results: Results may be tabulated under the following headings.

(a) Name of person (b) Age (c) Sex
(d) Type of meal (e) Time of meal
(f) Time of peak in breath hydrogen
(g) Mouth-to-caecum transit time

From the above data, the mean and standard deviation for transit time for each type of meal may be calculated.

(Question: What sort of controls and precautions need to be observed in this experiment, and why?)

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* Professor Colvin Goonaratna, Department of Physiology, Faculty of Medicine, Karapitiya, Galle.

References: References are to be found only in specialist journals not ordinarily available in schools, textbooks or libraries. They are available with the undersigned, and will be given to any teacher or group of students who may wish to do this project.

Instrument: The instrument is available in Sri Lanka only at the author's address. Professor Goonaratna will undertake to make it available for a project, and also train teachers and a few students doing this project in the use of this instrument.

DO MILK AND MILK PRODUCTS LIKE CURD, YOGHURT, CHEESE OR PUDDINGS HASTEN TRANSIT FROM THE MOUTH TO THE CAECUM IN "HEALTHY" PEOPLE?

C. Goonaratna*

Background: Milk and some milk products contain the disaccharide lactose, which can be hydrolysed in the gut only by the enzyme lactase into galactose and glucose. Lactase is found in the brush border of the small intestinal mucosa (1). In all populations studied so far a certain proportion of people are deficient in this enzyme (2). In such people varying amounts of the disaccharide lactose may reach the large intestine undigested and unabsorbed (3). When lactose reaches the caecum, bacterial action there results in the release of gaseous hydrogen, most of which is exhaled in the breath. This can be measured simply, safely and accurately using a special instrument called the 'hydrogen monitor'.

Suggested methods, special references, instrument and presentation of results, see previous project.

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*Professor Colvin Goonaratna, Department of Physiology, Faculty of Medicine, Karapitiya, Galle.

MEASUREMENT OF HEIGHTS AND WEIGHTS OF STUDENTS IN THE SCHOOL WHO ARE BETWEEN 10 AND 20 YEARS OF AGE.

M. I. Thabrew*

Background: If children do not get sufficient food, they fail to grow properly. Similarly, those without enough to eat lose weight and those who overeat gain weight. Measurements of weights of large groups of children at various ages are a valuable index of nutritional status when correctly interpreted. The weighing machine alone cannot determine their relative nutritional status; other physical measurements; especially height, are useful. It is important to realize that other factors besides food intake determine weight and height, notably, constitutional or genetic make-up. There are tall, thin, light people and short, thick-set, heavy individuals who may each be equally healthy. There may, however, be various medical reasons (eg, malnourishment, hormonal status) for the extremes in height and weight that may be observed in a few individuals. Therefore, the measurements of weight and height could be used as a simple diagnostic tool for the purpose of screening children who may need some medical attention.

Materials required:

a. A weighing balance: Spring balances are most unreliable. If used, they need regular checking and cannot be recommended for accurate work. The most reliable balances are the Lever (Beam) Balances made by reputable firms. These should be available at the nearest railway station and certain grocery stores (espeially wholesalers). I am sure, on a request from the school principal, the station master or store owner would grant permission for use of the balance.

   Since the weights vary according to the time of day as well as the clothing worn, in comparing individual weights with standards, it is important to make certain that weights are measured, under comparable conditions of clothing and at approximately the same time of day (eg, morning, afternoon or evening).

b. Apparatus for measurements of height: Heights should be measured against a flat vertical surface and the subject must stand (without shoes or slippers) as upright as possible on firm, level ground without raising the heel from the ground. A sliding headpiece is necessary for accurate work. However, in school, a colleague can be asked to place a foot-ruler on the head of the subject under investigation and make a mark where the ruler touches the wall at the back of the head. The height of the mark from the ground level can then be measured.

* Professor Ira Thabrew, Department of Biochemistry, Faculty of Medicine, Karapitiya, Galle.

Methodology: Students could be divided into age groups, for example, as follows:

a) 10-13 years old; b) 14-17 years old and
c) 18-20 years old.

Age should be in years and months after the last birthday.
Data for males and females should be tabulated separately.

Suggested presentation of results:

Results for each age group may be tabulated as follows:

Sex	*Age (Years and months)*	*Height (cm)*	*Weight (kg)*

For each age group,

a). a frequency distributions histogram (and curve) should be drawn in the usual manner.

(Question: What is the shape of the frequency distribution curve you obtain and what are the characteristics of this curve?)

b). From the data obtained calculate the mean (x) standard deviation (SD) and the standard error of the mean.

c). Note the children who fall outside the limits of the mean ± 2 standard deviations (X ± 2SD). These children can be regarded as being "abnormal", or more correctly, falling outside the "reference range" for that age and sex group.

(Question: What advice would you give the above children and their parents?)

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HOURLY CHANGES IN URNINARY SOLUTE CONCENTRATION AFTER DEHYDRATION (FLUID RESTRICTION) IN HEALTHY SRI LANKANS.

C. Goonaratna*

Background: Most of us know that the urinary solute concentration decreases and volume increases after drinking plenty of water, and that the reverse changes occur during dehydration. Solute concentration has been measured after 12, 24, 36 and 48 hours of dehydration (1,2,3) in healthy subjects in various countries. For Sri Lanka, published reports on this matter are very few (4).

In any case, the urinary solute concentration after fluid deprivation does not seem to have been studied systematically on an hourly basis.

This information might be useful in many respects. For instance, if the urinary solute concentration does not rise linearly with time, this may shed some new light on the way urinary concentrating mechanisms function. If there are clear-cut 'steps' in the increase of urinary concentration after dehydration, this may indicate a 'step-wise' enhancement of antidiuretic hormone secretion.

Suggested method.

Concentration of solute in urine may be estimated by

i. measuring urinary specific gravity using a suitably modified hydrometer, which is also called a urinometer.

ii. measuring urinary osmolality with a cryoscopic osmometer, which uses the principle of the relationship between the depression of freezing point and the content of osmotically active particles in a solution.

The second of these two is much the more accurate and precise method. (Why?)

(Both instruments are available at the address below, and Professor Colvin Goonaratna undertakes to train a few school teachers and students to use these instruments)

Procedure:

Healthy persons participating in the study are requested not to take any food or fluids after a usual dinner at 20.00 hours on the day before testing.

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On the following day, subjects taking part in the study should empty their bladder as completely as possible at 07.00 hours. Thereafter, they empty their bladder at hourly (or 2-hourly) intervals, and for each person the following recordings are made. NB. Urinary osmolality measurements are made in duplicate (Why?)

Subject I Name: Age: Sex:

Time of urine collection	*Urine volume*	*Urine flow (ml/min)*	*Urine osmolality (mosm/kg water)* 1 2 *mean*
08.00 hrs			
10.00			
12.00			
2.00			
4.00			

These data may now be summarized as follows

Hours of dehydration	*Mean urine flow rate (ml/min)*	*Mean urine osmolality (mosm/kg water)*
12		
14		
16		
18		
20		

REFERENCES.

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RESPIRATORY FUNCTION IN A GROUP OF SCHOOL CHILDREN AND ITS CORRELATION WITH AGE AND HEIGHT.

M. Udupihille*

Introduction:

Measurement of vital capacity is a good index of respiratory function. The usual method of measuring the vital capacity is by the spirometer which is not available in school-level laboratories. A simple apparatus which could be used for assessing lung function has been described (NARESA workshop on student projects 1985). The results obtained with this apparatus was found to correlate significantly with measurements of vital capacity obtained using a spirometer.

Vital capacity is defined as the maximum volume of air expelled from the lungs following a maximal inspiration.

Materials: 5L glass bottle with a tight fitting cork and outlet near bottom (aspirator bottle)
2 metres long 2.5 - 3 cm wide glass tube.
A centimeter scale attached to the tube. 2m 1½cm wide rubber tubing. Meter scale to measure height.

Method: The apparatus is assembled as shown in the diagram. The bottle is filled with 2.5L water. The zero of the centimeter scale should be at water level.

For smaller children, a 3L bottle with 2L water may be sufficient.
The student is asked to blow as hard as possible through the rubber tube. This causes the water level in the bottle to go down and the water in the tube to rise. The highest level to which the water rises is read off the scale. The best of the three readings is recorded.

Height is measured with the child standing straight, feet tegether without shoes.

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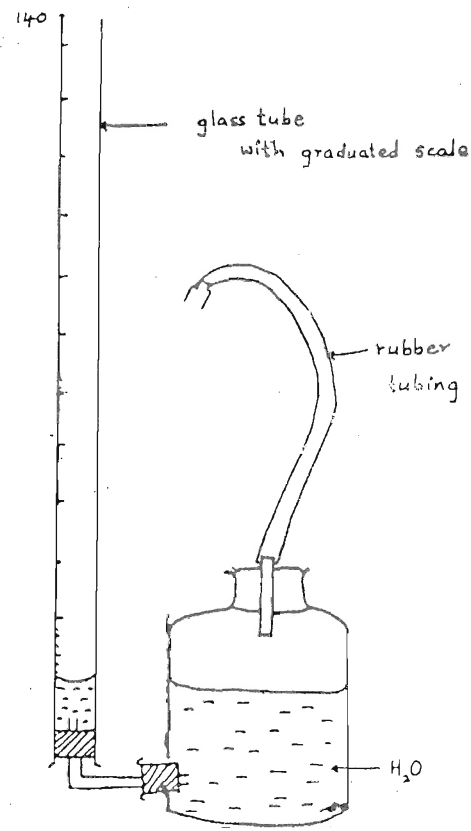
Results: Collected in the following format.

Name or initial	*Age*	*Sex*	*height*	*height of water column 1, 2, 3*

Analysis: Mean ± SD of height, best height of water column. Plot graphs with height against height of water column.



DETECTION OF MYOPIA IN A SCHOOL POPULATION

P. Balasuriya*

Several studies done in the recent past have shown that the incidence of myopia (short-sightedness) in the new entrants to the University is in the order of 16-17% (Udupihille, 1985, 1987). Some of these cases are undetected even at the time of entry to the University. Myopia obviously leads to difficulty with academic performance. Early detection and correction of the defect would help the student to improve his/her performance at school.

Even in schools where regular medical inspections are done, the last examination is done in year 8. Therefore the students who develop myopia after year 8 in these schools or at any stage in other schools remain undetected unless poor vision is reported by the student or suspected by a teacher, parent or any other person.

This study would help to identify the defect in a school population. Those who suffer from myopia but were unaware of it, could seek medical assistance early.

APPARATUS

A Snellen chart

These charts are available at the following places:—

(a) Eye clinics in hospitals
(b) Opticians
(c) Medical Faculties in Universities
(d) Some private practitioners

It may be possible to obtain permission from one of the above places to copy a chart even though it may not be 100% accurate. The chart available at Department of Physiology, Faculty of Medicine, Peradeniya, may be used to make a copy after obtaining written permission from the Head of the Department.

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The chart contains rows of letters of diminishing size. Each row is marked with the distance at which a person with normal vision should just be able to read it. A smaller copy of the Snellen chart is shown in Fig. I.

A modification of the chart is available to test subjects who are unable to read. The modified chart consists of rows of diminishing size of letter E facing different directions (Fig. II). Each row is marked with the distance at which the letters are just clear to a person with normal vision.

Fig. I

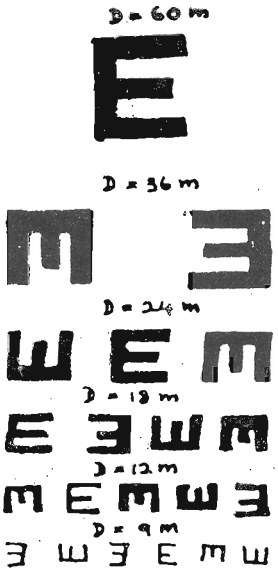

Fig. II

The charts could be copied on white paper paying special attention to the exact size, thickness and darkness of the letters. They can then be pasted on cardboard.

An eye-shade made with black paper. It should be possible to hold it in position covering one eye completely by tying it round the head.

METHOD

The subject is made to stand at a distance of 6 m from the chart placed vertically at eye level in a brightly lit room. Each eye is tested separately. One eye is covered using the eye shade and the subject is asked to read the letters on the chart as far down as possible starting with the first row.

The results are reported in terms of visual acuity, i.e., the distance at which the board is read (6 m) divided by the distance at which the last line that he can read, should be read, eg. with the left eye if he can read only up to line 4 (marked 12 m), visual acuity for left eye = 6/12. Normal eyes have a visual acuity of 6/6.

If the subject is unable to read letters, he is tested using the modified chart placed 6 m from him. Starting with the first row, he is asked to indicate in which direction the arms of each letter E is facing. The last line which he indicates clearly is noted and reported in terms of visual acuity for each eye as before.

A person who has a visual acuity of less than 6/12 with the better eye is considered to have myopia.

Results :

Results could be tabulated as follows.

Name	Visual acuity	
	left eye	right eye

Outcome :

The percentage of myopics in the population studied could be calculated.

Those who are found to be myopic could be informed if they are already not aware of it, so that they could seek medical advice.

REFERENCES

Udupihille, M. et al Proceedings of the Kandy Society of Medicine (Oct. 1985) 8(1):46

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ATTENDANCE AT SCHOOL

P. Balasuriya*

Poor attendance at school is a problem among some school children. This may be either due to illness or due to other causes like parental neglect or ignorance, poverty, etc. In a recent study done in schools around Kandy, 20% of schools absenteeism was found to be due to medical reasons. (Perera et al, 1987).

The aim of this study is to determine the percentage of absent days in a selected school population and to identify the major reasons for absenteeism. One or two specified school terms in an academic year could be used as the period of study.

Meterial required

One or more registers of the student population selected for the study.

No. of copies of a questionnaire according to the format attached. (Only the serial no. and not the name to be entered).

Methodology

Attendance of the study group should be marked on the register on every school day during the period of study.

All students absent on the previous school day/days should be selected and given a questionnaire each. A serial no. should be allocated to each selected student and this should be entered in a separate book as well as on the questionnaire. Before requesting the student to fill the questionnaire, its purpose should be explained to him. It should be made clear that the information obtained is confidential and will not be divulged to those concerned with disciplinary action. He/she should be persuaded as far as possible to give the true cause for being absent from school. The filling of the questionnaire should be done on the first day of return to school after the absence.

The completed questionnaires should be filled separately.

Results

At the end of the period, the results could be analysed on the following lines.

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Period of study...
Total no of school days...
Total no of absent days...
Total percent of absent days due to medical reasons...
Total percent of absent days due to other reasons...
Medical and other reasons for absenteeism where the incidence is high could be determined.

Outcome

It may be possible to remedy some of the causes of school absenteeism by advice given by a teacher to the students and/or to the parents and by taking other necessary action whenever possible.

REFERENCES

Perera S.J. et al. Proceedings of the Kandy Society of Medicine (Dec. 1987), 10:15.

Questionnaire:

Serial No. Class

Age Sex

Date absent	**Reason for absence Medical/Other reasons**
1.	
2.	
3.	
4.	
5.	
6.	
7.	

If absent due to a medical cause, give main complaint.

e.g. sore-throat
diarrhoea
abdominal pain
cold
fever
headache
any other

Treatment taken - nothing/home-remedy/ayurvedic/western —

If absent due to any other cause, give reason.

e.g. attending a clinic for treatment
missing the bus
illness in family
bereavement
rainy day
visiting
wedding
religious ceremony
any other

HOW LONG DO ANT TRIALS LAST?

W. E. Ratnayake*

Background:

Trail substances of ants are special types of pheromones produced in tiny quantities in abdominal glands and are powerful attractants. These are peculiar to each ant species. Ants follow one another along these trails using their antennae to detect the trails.

Suggested procedure:

Select ant species that are recruited along trails to baits such as sugar, water, buttered bread, crumbs, freshly killed insects etc. Identify these ants accurately. Place 6" x 6" piece of clean paper (white sheet of paper) across trail of ants and allow them to make trail on the paper. Then shake off ants and shift position of paper by definite amount (say 1cm at a time) and record *time* taken for ants to find trail on the paper again. For varying distances of trail on paper from main trail varying times can be recorded for ants to find trail on the paper and a graph can be drawn to obtain maximum time the trace of the trail is available.

The paper with the trail substance can be shifted in various ways to obtain further information if necessary. Instead of a paper any other flat substance can be used.

The experiments will have to be repeated a number of times to obtain valid results. Statistical tests will have to be used to analyse the data. As an approximation the average, or mean times only, can be used.

Different species of trail laying ants can be used in this experiment to study differences in properties of the trail substance.

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* Professor Winston E. Ratnayake, Department of Zoology, University of Sri Jayewardenepura, Nugegoda.

2. Bingham C.T. Lt. Col *(1903) The Fauna and Flora of British India Vol II Ants and Cuckoo — wasps. Taylor & Francis, London. Presently available as Reprint of Today & Tomorrow's Printers & Publishers New Delhi (1975).*

(Available at Bio Library, Dept. of Zoology, University of Sri Jayewardenepura)

ANTS THAT PREFER SALT TO SUGAR

E. T. Mahindadasa*

Background: Usually ants are attracted by sugar, e.g. the ant called 'ambalaya' in Sinhala is very fond of sugar. The author has noticed, however, that some kinds of ants are attracted by common salt, and that their movements were affected after taking the salt.

Sugested procedure. Keep samples of common salt crystals at different places (inside the house, in the compound, in the garden, near a well, in a paddy field etc.) Note the number of ants coming to feed on the salt.

Results could be set out as follows.

Place where the salt was kept	Number of ants present after 15 minutes	Kind of ant

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INSECTS BREEDING ON MEAT

W. E. Ratnayake*

Background:

Although Pasteur proved conclusively that "life begets life" even for microscopic bacteria, yet the ideas of spontaneous generation of life even for larger animals like flies and mice persist. A practical demonstration would conclusively prove that flies originate from the eggs laid by flies and not spontaneously. At the same time such experiments can be made use of to find out the types of flies that lay eggs on meat and perhaps, if these flies, in turn are parasitized by other insects.

Suggested procedure:

Buy about 150g of meat and cut it up into three equal portions. Boil two portions thoroughly and place these two and the unboiled portion in three separate beakers (or empty jam bottles). Close the mouths of one beaker (or jam bottle) with the boiled meat and the other with the unboiled meat with pieces of cloth. Keep the beaker (or jam bottle) with the other piece of boiled meat open for about 2-3 days and then close the mouth of that beaker (or jam bottle) also with a cloth. Leave in safe place.

Make daily observations of the pieces of meat in the three beakers and record observations in an appropriate manner.

If maggots (larvae of flies) are seen in the beakers (or jam bottles) with boiled meat exposed for 2-3 days or in the beaker (or jam bottle) with unboiled meat allow them to pupate. Take these pupae out and count them and place them in clean vials (small bottles) and plug their mouths with cotton wool. When the adults emerge from the pupae they can be killed (with either or chloroform) and the species identified. Along with the flies may emerge the parasitic insects which are mostly hymenoptera.

Identification of these species of insects can be made at the National Museum in Colombo or by sending specimens to Director, Commonwealth Institute of Entomology, 56, Queens Gate, London SW7 5JR, UK. Identification of animal species is a specialist's job.

Instead of meat, any other food substance can be collected and kept in cotton wool plugged containers to obtain their specific insect pests and perhaps also the parasites of these insect pests.

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PARASITISM BY INSECTS OF COCKROACH OOTHECAE

W. E. Ratnayake*

Background

Pariplaneta americana is the most abundant of crockroaches in Sri Lanka. Its ootheca is parasitized by *two* hymenopoteran wasps which lay their eggs in the oothecae and where larvae eat up the young developing stages of the cockroach. The two parasitic insects are *Tetrastichus hegenowii* and *Evania appendigaster*. The seasonal variation of percentage parasitism can be easily studied.

Suggested Procedure

Collect *monthly* about 25 - 30 oothecae (both live and empty ones) from dark corners of the household. With hand lens check for holes bored in the wall of the oothecae. A small hole is made by *T. hegenowii* and a larger one by *E. appendigaster*. These oothecae will be empty.

Keep the live (non-empty) oothecae one each in small glass bottles with mouth stoppered with cotton wool. Examine daily until young (either cockroach nymphs or parasites) hatch out.

Recordy our results each month for about one year to ascertain the seasonal fluctuations in percentage parasitism. It is advisable to release all cockroach nymphs and parasites that hatch out of the oothecae in the bottles. It will be necessary also to record daily temperature and rainfall figures.

After the survey is over only parasites can be released while the cockroach nymphs in the bottle can be destroyed.

A certain number of oothecae can be dissected to study the life history of either the cockroach or its parsites as additional work to enlarge the scope of the project.

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1. Gamalath P. (1980) Investigation of the biology and life history of *Tetrasticus hagenowii* (Ratz) the egg parasite of the american cockroach *Periplaneta americana* (L)
M.Sc. Thesis, University of Sri Jayewardenepura.

2. Kumarasinghe, N.C. (1984) The biology and the behaviour of *Evania appendsgaster* (L) (Hymenoptera: Evaniidae) an oothecal parasite of *Periplaneta americana*
M.Sc. Thesis, University of Sri Jayewardenepura.

(Both these are available at NARESA Library or the Bio Library of the University of Sri Jayewardenepura)

CERCARIAE AND INFECTION OF FISH

W. E. Ratnayake*

Background:

Cercariae are the free-living infective stage of trematode parasites. They can be easily studied in the laboratory with a few pieces of standard laboratory equipment. Various problems can be studied in a comparatively short period of time.

Suggested method:

Melanoides tuberculata is a species of gastropod molluscs (snails) that live in the mud of fresh water streams and shallow lakes. Their shells are black in colour and are about one inch (2.54 cm) in length. Collect these snails and place about 10-20 of them each in empty jam bottles filled with clear water. It is preferable to choose those snails where the tips of their shells are broken or chipped off. Observe in a few days against an illuminated background and tiny flecks can be seen going up and down in the clear water in the jam bottles.

If such flecks are visible then take a snail or two from such bottles and cut the end of the shell with a pair of scissors and tap the cut edge onto a clean glass slide. Observe the juice of the snail under the low power of a student's microscope. You will be able to see the cercariae (and other stages of the trematodes such as redia and sporocysts) twisting and turning in the drop of water.

If you are lucky you will observe a cercaria with a forked tail (furcocercaria) and whose body is broader than its length. This is a peculiar trematode and is called *Transversotrema patialense,* Soparkar. This is an ectoparasite of fish such as *Ophiocephalus orientalis, Macropodus latus* and *Anabas testudineus* and live underneath their scales.

When these cercariae (flecks) are seen in the clear waters of the jam bottles with the snails you can introduce one of the above types of fish into them. Have a series of such jars (say 7) with about 10-20 snails in each. Select those bottles that show the flecks (cercariae) and add one fish each of a particular fish species into them. Cover the mouth of the bottles with muslin cloth or net.

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From the day after the introduction of fish take out one fish every other day and scrape off the scales onto a watch glass with saline solution (0.7% NaCl) and place fish back in the bottle. Observe under the low power of a microscope and make drawings of the trematode you would observe. You would obtain different stages (sizes) of the trematode in this way. If necessary make permanent stained (borax carmine preparations of the trematode and observe the various stages more carefully under higher power.

The cercariae in the bottles can also be studied for their various activities. For instance, the speed of its movements, how long it can survive, effects of temperature on movement, infection of snails from fish etc. There may be cercariae of other trematodes.

Equipment & Chemicals

Students microscope, watch glasses, empty jam bottles, glass pipettes, pair of scissors, glass slides, cover slips, alcohol series, borax carmine, canada boalsam, xylol (or clove oil).

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Crusz, H., W.E. Ratnayake & A.H. Sathananthan (1964) Observations on the structure and life cycle of the digenetic fish trematode *Transversotrema patialense* (Soparkar) Cey. J.Sc. (Bio. Sci.) Vol 5, (1), pp: 8-17