

Paramecium Population Dynamics

Aim:

- To identify the protist species and estimate protist population size through sampling.
- To study population growth in the lab species of Paramecium.

Materials and methods:

For preparation of cultures:

The standard protocol as provided was followed.

Procedure:

For data collection:

We setup two cultures of volume 50 mL each.

The flasks were named as 'A' and 'B'.

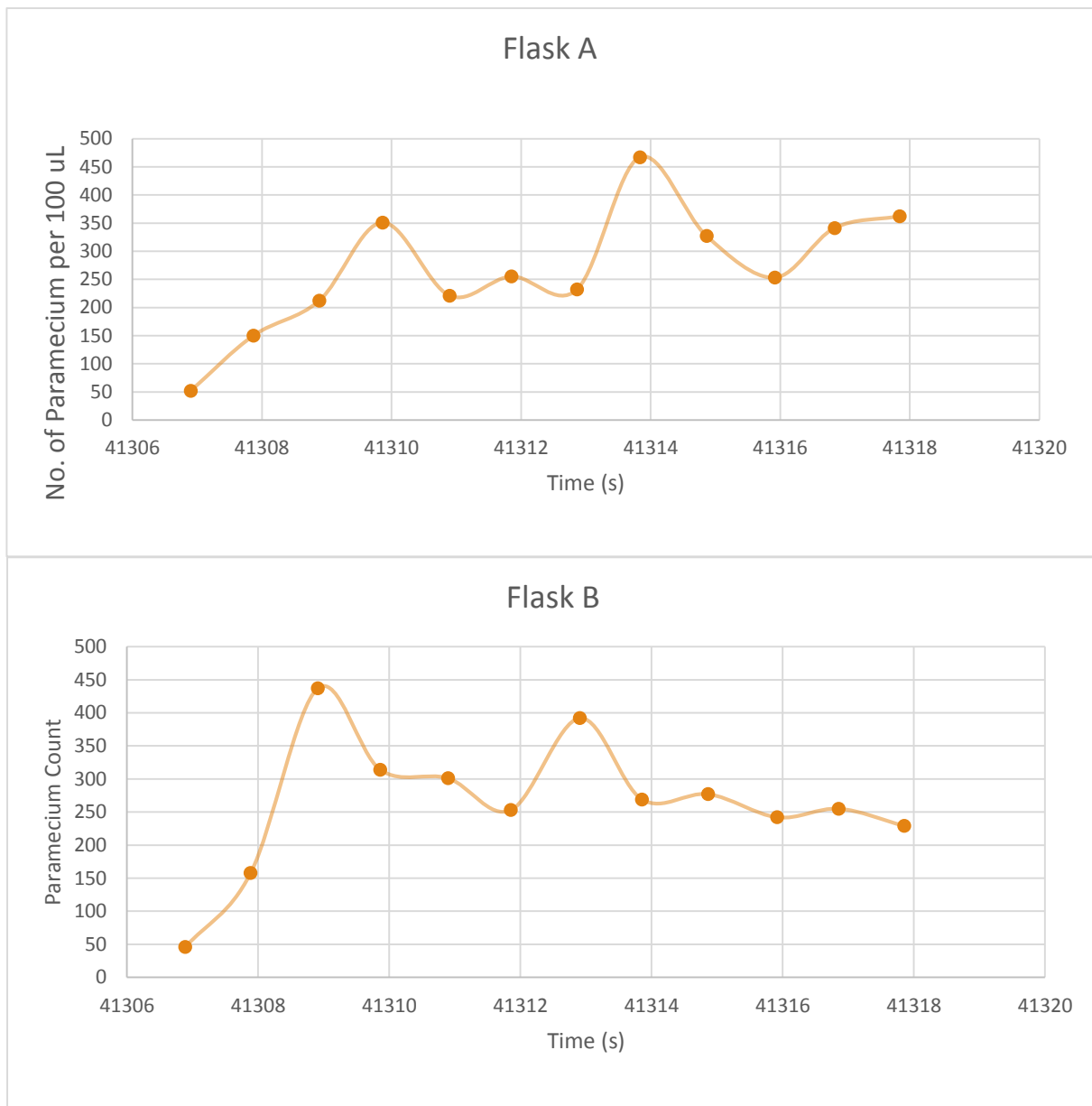
For 10 days, we determined the density of 100 uL of each of the cultures.

We initially took 5 drops of 20uL, but as the density began to rise on the by the 3rd day, we reduced the drop size to 10uL.

OBSERVATIONS:

The data and the plots are produced below:

				15	10	39	7-Feb-	21:45:0	10	4131		41312.9
B	37	33	67	1	4	2	13	0	0	2	0.90625	1
						26	8-Feb-	20:30:0	10	4131	0.85416	41313.8
B	52	45	67	63	42	9	13	0	0	3	7	5
						27	9-Feb-	20:45:0	10	4131	0.86458	41314.8
B	42	71	69	43	52	7	13	0	0	4	3	6
						24	10-Feb-	22:00:0	10	4131	0.91666	41315.9
B						2	13	0	0	5	7	2
						25	11-Feb-	20:31:0	10	4131	0.85486	41316.8
B	47	60	44	71	33	5	13	0	0	6	1	5
						22	12-Feb-	20:30:0	10	4131	0.85416	41317.8
B	49	38	36	51	55	9	13	0	0	7	7	5



Result:

We observed that initially the growth is exponential but after reaching a maxima, it saturates and oscillates about it. Thus we conclude it's following the logistic model and the oscillations are most likely caused by response time and other biological factors.

Energy allocation in plants

Aim:

To study the allocation of resources to somatic growth and reproduction in plants.

Materials required:

Plant specimens, aluminium foil.

Apparatus required:

Weighing balance, Hot air oven.

Method:

- 1) We collected at least three plant specimens of 3 species of plant.
- 2) The reproductive parts of the plant like the fruits, flowers were carefully separated from the somatic part (remaining) excluding the roots.
- 3) The two parts were packaged separately in aluminium foil and labelled properly.
- 4) These were dried in the hot air oven for 2 days.
- 5) The two parts were weighed for their dry weight.

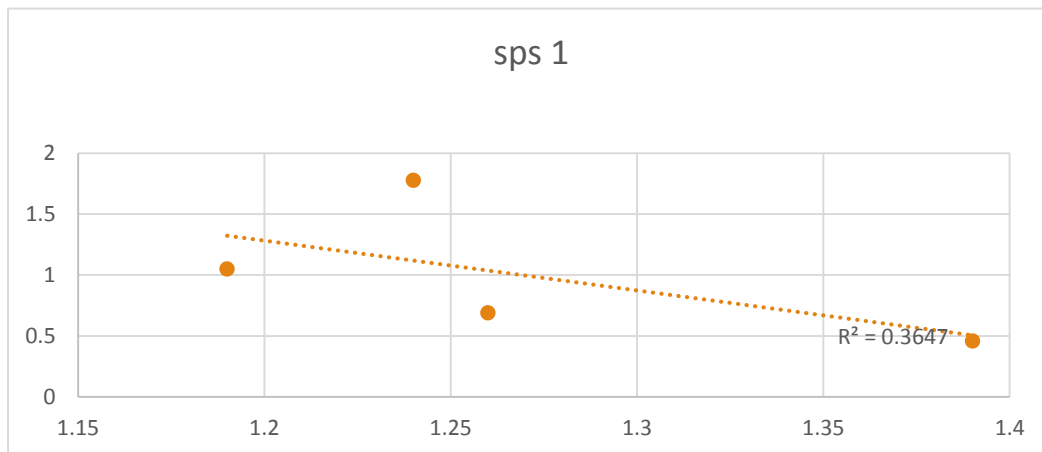
DATA:

Species	Plant	Somatic Mass(g)	Reproductive Mass(g)	Net mass (g)
1	1	1.26	0.69	1.95
	2	1.19	1.05	2.24
	3	1.24	1.78	3.02
	4	1.39	0.46	1.85
2	1	0.22	0.08	0.3
	2	1.18	0.2	1.38
	3	0.94	0.35	1.29
3	1	3.85	0.47	4.32
	2	3.65	0.32	3.97
	3	3.62	0.23	3.85
	4	0.58	0.26	0.84
	5	4.12	1.55	5.67

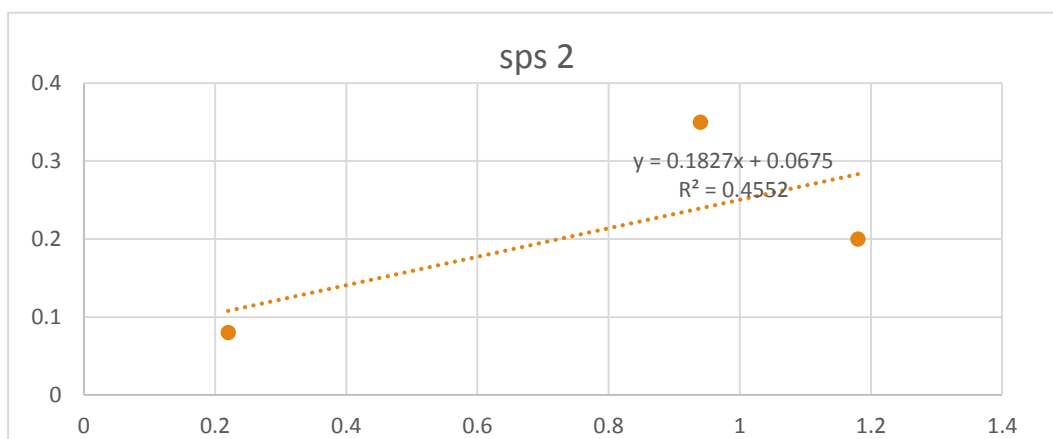
ANALYSIS:

Hypothesis:

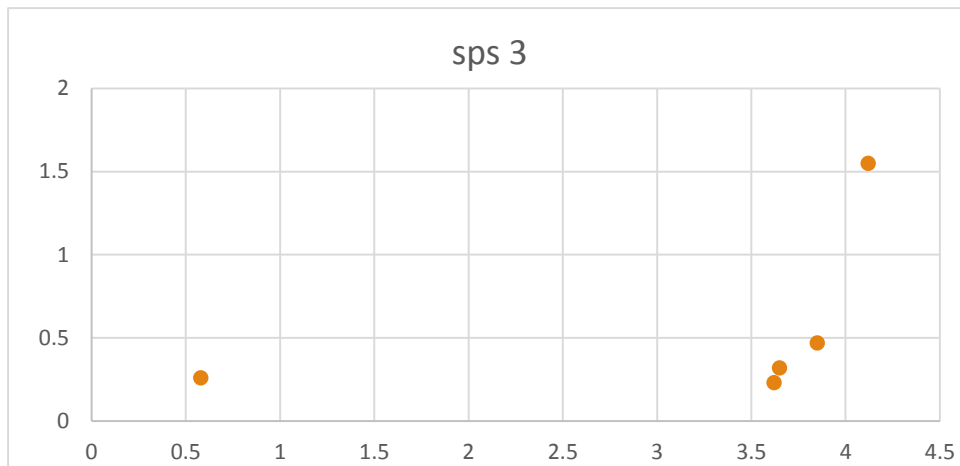
In this species there is an inverse relationship between investment in somatic growth and to reproduction.



In this species we observe a positive correlation between energy invested in somatic growth and reproduction.



We see some sort of positive correlation between somatic growth and reproduction.



Winogradsky Column

Aim:

To observe changes in terms of stratification.

Observations:

CONTROL

3rd March 2013

CONTROLL

Zero Level

No growth, appears greenish, Nothing else present.

First Level

Very little silica present

Second Level

Silica crystals, some plant moss like structures.

8/03/2013

Control(10X magnification)

- 1) Bottom layer- Silica as dark colored big pieces, light colored stationary structures can also be seen.
- 2) Bubble like tiny organisms can be seen moving very fast underneath the food materials, thread like structures of light green color can also be seen. The thread like structures look like plant roots.
- 3) Bubble like organism which are a lot smaller than the parameciums can be seen.

4)Moreover, an organism with a tail, which looks more like a wine glass shaped one. This wine glass shaped organism looks transparent, but it can also change its shape.. becomes circular, wine glass shaped and so on..

5)It tends to move along a straight line. We did not see any organism to organism interaction amongst these..

Middle layer- Silica, bubble like organisms, drop shaped transparent organisms moving very fast (but only one) can also be seen.

Top Layer- Some structures that appear like plant root, silica could be seen.

17th March 2013

CONTROL

Nothing

18/03/2013

b) Control –(Magnification 10X)

Zero level

Silica, much extremely small bubble like structures.

First Level

Same as the zero level.

Second level

Silica and a large number of ciliates and round organisms.

Third level

Same as the second level.

25/03/2013

CONTROL

Top Layer- Nothing

Bottom layer- Nothing

Middle layer- Nothing

8th April 2013

Control

empty except silica

NaOH

3rd March 2013

NaOH

Zero Level

No mud, silica. No organisms present

First Level

No mud, silica. No organisms present.

Second level

Contains silica

8/03/2013- Winogradsky column observations

a) NaOH (10X magnifications)

Top Layer- A lot of sand particles

Middle layer- smaller parameciums and baby parameciums also

Bottom layer- Smaller than the lab parameciums.

17th March 2013

NaOH

Zero Level

Same organisms as the second level.

First Level

Nothing

Second Level

Only one type of organism. It is very small under 4X, has an oval shape and travels at a moderate speed, with respect to paramecium.

Third Level

Same organisms as in second level. Nothing Else.

18/03/2013

c) NaOH- (Magnification 10X)

Zero Level

Silica and extremely tiny round organisms.

First Level

Slightly big black round organisms, silica and extremely tiny round organisms.

Second Level

Silica and many huge ciliates

Third Level

Extremely fast moving ciliates, very tiny round organisms and a lot of silica.

25/03/2013

NaOH(10X Magnification)

Top layer- Small sized parameciums, small transparent organisms that seems to have contaminated the cultures.

Middle layer- Nothing

Bottom Layer- small parameciums.

8th April 2013

Naoh –

middle- 10x small paramecium ,rest silica

EGG YOLK

3rd March 2013

EGG YOLK

Zero Level

Silica crystals, some plant moss like structures, very tiny black dot like organisms.

First Level

Contains silica crystals

Second Level

Lots of mud and silica crystals.

8/03/2013- Winogradsky column observations

EGG YOLK(10X Magnification)

Top Layer-

1)Lots of silica, oval organisms which are transparent and they move in circles are seen. Their motion is like, moves in circles and then stays, and so on..

2) Other smaller bubble like fast moving organisms can also be seen.

Middle Layer-

Silica plus same as the top layer.

Bottom Layer-

1) Silica, same as top layer, plant like or some stuff that looks like moss.

2)We say plants because of the thread like appearance when compared with silica crystals.

18/03/2013

a) Egg Yolk- (Magnification 10X)

Zero Level

Some silica, transparent membranous structures, tiny bubble like structures floating about.

First Level

A lot of silica, some ciliated transparent structures with dog tail kind of motion.

Second Level

Contains silica, very fine hair like structures, some ciliated transparent organisms

Third Level

Same as the second level observation.

25/03/2013

EGG YOLK

Nothing

8th April 2013

Egg Yolk –

top –

10x small transparent spherical organisms, rest silica

UREA

8/03/2013

b) Urea (4X magnification)

Bottom layer- A lot of sand particles. No moving things

Middle layer- thread like structures, lots of sand

Top layer- Sand particles, No moving organisms

18/03/2013 – Winogradsky Column Observations

Urea-(Magnification 10X)

Zero Level

Silica and fine transparent hair like structures

First level

Silica, fine transparent hair like structures, small tiny transparent bubble like structures

Second Level

Same as the first level

Third level

Only Silica and nothing else

25/03/2013

UREA

Nothing

3rd March 2013

UREA

Zero level

No mud, silica. No organisms present.

First level

No mud, silica. No organisms present.

Second level

Contains silica .

8th April 2013

Urea –

empty except silica

17th March 2013

UREA

Nothing

DISCUSSION:

- 1) The paramecium observed in the NaOH columns were found only in the depressions.

These paramecium were seen under 10 X.

We cultured these paramecium in standard yeast- wheat culture and a substantial growth in their size was observed.

- 2) The bacteria growing in the egg columns are the sulphur bacteria.

Reference :

The pictures are appended at the end of this document.

CAR DIVERSITY

SHANNON WEINER DIVERSITY INDEX

A value near 0 would indicate that every species in the sample is the same i.e. one dominant species.

Conversely, a value near 7 would indicate that the number of individuals are evenly distributed between the 5 species.

Species	Frequency	Pi	ln(Pi)	Pi*Ln(Pi)
Ford	1	0.034482759	-3.36729583	-0.116113649
Honda	1	0.034482759	-3.36729583	-0.116113649
Tata	4	0.137931034	-1.981001469	-0.273241582
Maruti	6	0.206896552	-1.575536361	-0.32597304
Suzuki	7	0.24137931	-1.421385681	-0.343093095
Hyundai	10	0.344827586	-1.064710737	-0.367141633
TOTAL	29	1	-12.77722591	-1.54167665
H = 1.54				

Species	Frequency	Pi	ln(Pi)	Pi*Ln(Pi)
Nano	1	0.034482759	-3.36729583	-0.116113649
Ritz	1	0.034482759	-3.36729583	-0.116113649
swift	1	0.034482759	-3.36729583	-0.116113649
A-star	1	0.034482759	-3.36729583	-0.116113649
Indigo	1	0.034482759	-3.36729583	-0.116113649
Fiesta	1	0.034482759	-3.36729583	-0.116113649
City	1	0.034482759	-3.36729583	-0.116113649
Wagon R	2	0.068965517	-2.674148649	-0.184424045
800	2	0.068965517	-2.674148649	-0.184424045
Santro	2	0.068965517	-2.674148649	-0.184424045
Accent	2	0.068965517	-2.674148649	-0.184424045
Indica	2	0.068965517	-2.674148649	-0.184424045
Alto	3	0.103448276	-2.268683541	-0.234691401
Zen	4	0.137931034	-1.981001469	-0.273241582
i10	5	0.172413793	-1.757857918	-0.303078951
TOTAL	29	1	-42.94935698	-2.545927703
H=2.54				

Species	Frequency	Pi	ln(Pi)	Pi*Ln(Pi)
White	11	0.379310345	-0.969400557	-0.36770366
of white	2	0.068965517	-2.674148649	-0.184424045
purple	3	0.103448276	-2.268683541	-0.234691401
Red	5	0.172413793	-1.757857918	-0.303078951
Green	1	0.034482759	-3.36729583	-0.116113649
Silver	4	0.137931034	-1.981001469	-0.273241582
black	1	0.034482759	-3.36729583	-0.116113649
Blue	2	0.068965517	-2.674148649	-0.184424045
Brown	1	0.034482759	-3.36729583	-0.116113649
TOTAL	30	1.034482759	-22.42712827	-1.895904631
H=1.89				