INTRODUCTION

What happened to the commercially-important crops during pest outbreak?

Source:http://www.knowledgebank.irri.org/index.php?option=com_zoo&task=item&item_id=926&Itemid=757

Source:http://www.farmindustrynews.com/insecticides/worst-pests-corn-and-soybeans-which-insects-look-out-2013

Source:http://knowledgebank.irri.org/training/factsheets/pestmanagement/insects/item/rice-bug

INTRODUCTION

What was the immediate option of the farmers?

Source:http://www.mindanews.com/top-stories/2016/06/philippines-must-catch-up-with-asean-neighbors-duterte/

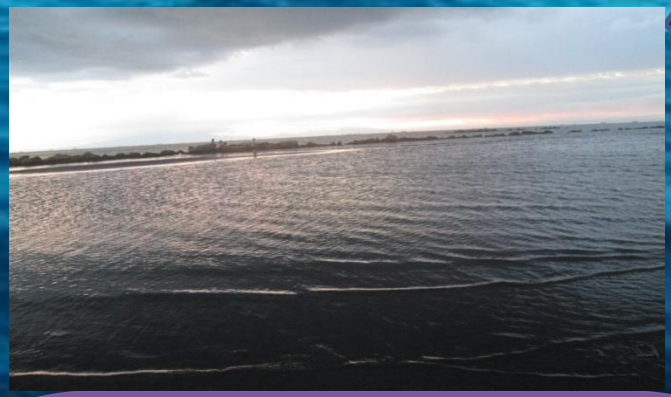
Source:http://www.marketmanila.com/archives/insecticides-on-the-strawberry-fields-of-la-trinidad-benguet

INTRODUCTION

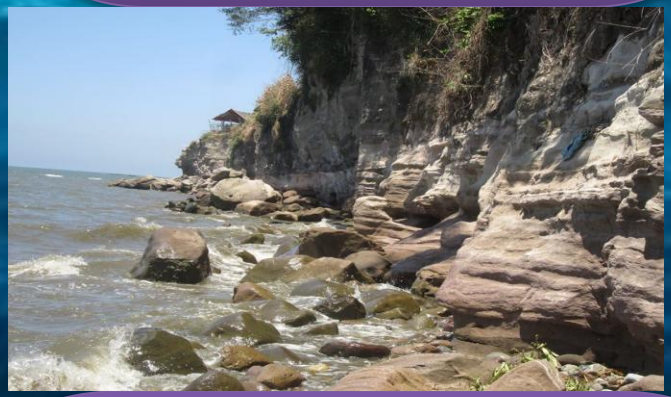
Where did this pesticide go?

Pesticide residue in the farm

Transported to the river



Continued its route to the ocean



Harmed the marine organisms

INTRODUCTION

How these organisms were harmed by the pesticides?

Source: http://www.daviddarling.info/encyclopedia/D/diatom.html

CELL DENSITY AND CHLOROPHYLL a CONTENT OF *Navicula sp.* EXPOSED TO THE DIFFERENT CONCENTRATIONS OF PESTICIDE CYPERMETHRIN

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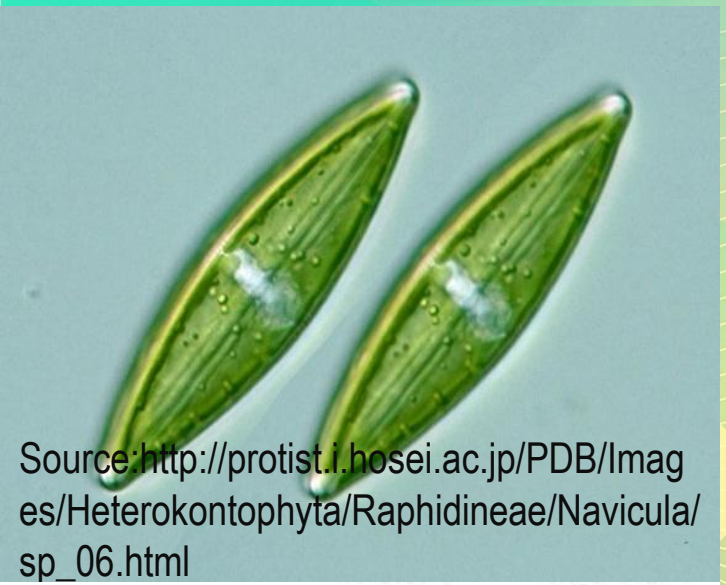
INTRODUCTION



Source:http://protist.i.hosei.ac.jp/PDB/Images/Heterokontophyta/Raphidineae/Navicula/sp_06.html

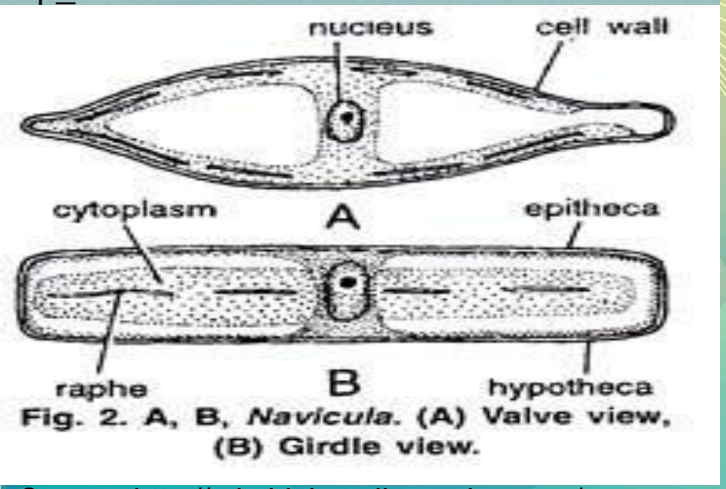


Fig. 2. A, B, *Navicula*. (A) Valve view, (B) Girdle view.

Source: http://cdn.biologydiscussion.com/wp-content/uploads/2016/09/clip_image006_thumb2-1.jpg

What is *Navicula sp.?*

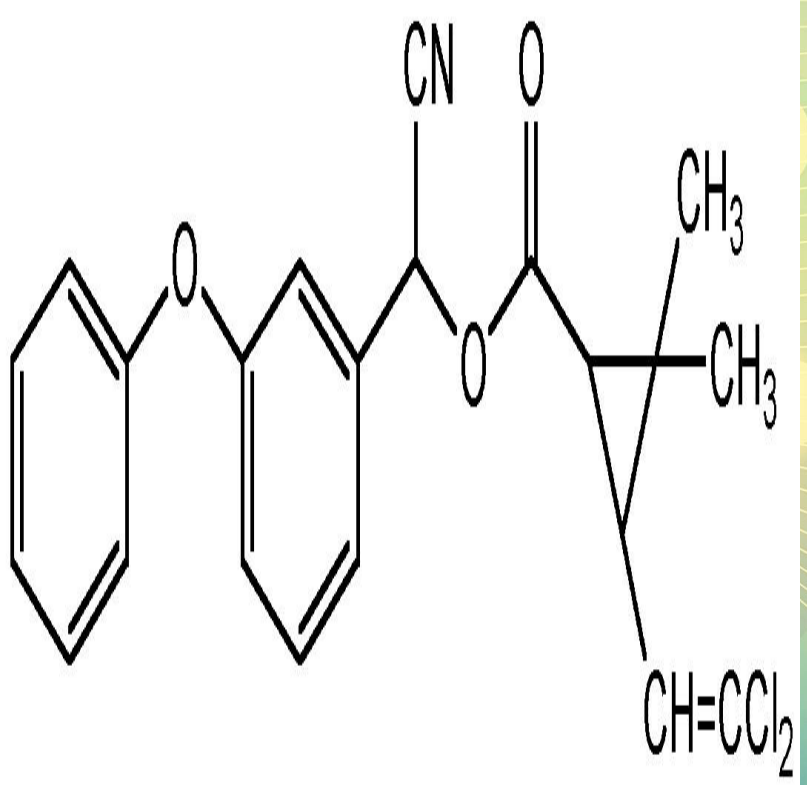
- ❑ Latin for "small ship"
- ❑ English for a "boat shaped incense-holder"

Taxonomic classification

- ➢ Domain Eukarya
- ➢ Kingdom Chromalveolata
- ➢ Division Heterokontophyta
- ➢ Class Bacillariophyceae
- ➢ Order Naviculales
- ➢ Family Naviculaceae

INTRODUCTION

What is Cypermethrin?



- One of the widely used insecticides
- Use as a foliar application on food and feed crops
- Very low volatility and water solubility

Source:https://www.chemservice.com/cypermethrin-n-11545-100mg.html

INTRODUCTION

Objectives of the Study

GENERAL

- Evaluate the effects of cypermethrin to the cell density and chlorophyll a content of *Navicula* sp.

SPECIFIC

- Determine the cell density of *Navicula sp.* during its log phase of culture at different concentrations of cypermethrin
- Determine the chlorophyll-a content of *Navicula sp.* during the said phase of culture at various concentrations of cypermethrin
- Determine if the cell density and the amount of chlorophyll a of *Navicula sp.* varied with the different concentrations of cypermethrin

INTRODUCTION

Significance of the Study

- Inform the general public about the undesirable effects of pesticides on the aquatic environment which serves as habitat of the aquatic organisms like phytoplankton.

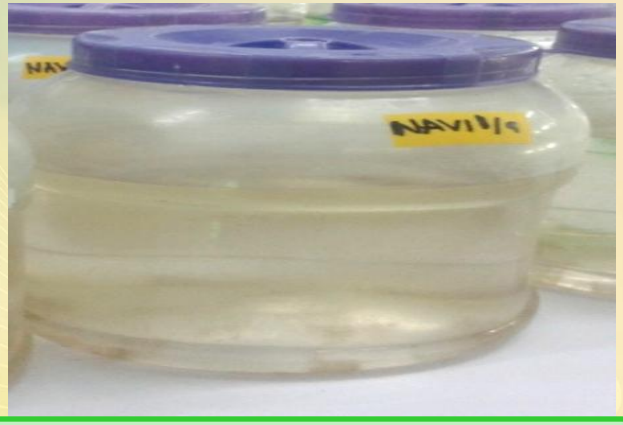
- They may able to make precautionary measures on the utilization of the pesticides.

- Furthermore, the results of the current study will create an avenue for the people to realize the value of the diatoms in the aquatic communities.

MATERIALS AND METHODS

CULTURE OF *Navicula sp.*

Pure culture



1-L pure culture enriched with F medium

3-L culture enriched with TMRL

Transport of the diatoms

MATERIALS AND METHODS

EXPERIMENTAL SET UP

Design – Randomized Complete Block Design (RCBD)

- ⇒TREATMENT 1 (without pesticide)
- ⇒TREATMENT 2 (32ppm Cypermethrin)
- ⇒TREATMENT 3 (16ppm Cypermethrin)
- ⇒TREATMENT 4 (8 ppm Cypermethrin)
- ⇒TREATMENT 5 (328ppm Chlorpyrifos)

MATERIALS AND METHODS

HARVESTING OF *Navicula sp.*

Brushing the surface of the basin

Getting 300 mL of *Navicula sp.* solution in each sample

Transfer to the sterilized bottle

Transport of 300mL *Navicula sp.* solution

MATERIALS AND METHODS

PROCESSING OF THE SAMPLES for Cell Counting

300mL *Navicula sp.* solution

Sample was placed in the Eppendorf tube

A drop of bleach was added in the sample

A drop of sample solution was placed in the hemaecytometer

MATERIALS AND METHODS

PROCESSING OF THE SAMPLES
for Cholorophyll- a Content Analysis

Draining of the sample

Filtration

Storage

MATERIALS AND METHODS

DETERMINATION OF Cell Density of *Navicula Sp.*

Cell Density = $(X \ .10^4)/v$

where: X = total cell count/no. of blocks counted

v= volume of sample put in a hemaecytometer

Total Cell Count= A + B + C + D + E

where:

A= number of cells in block A

B= number of cells in block B

C= number of cells in block C

D= number of cells in block D

E= number of cells in block E

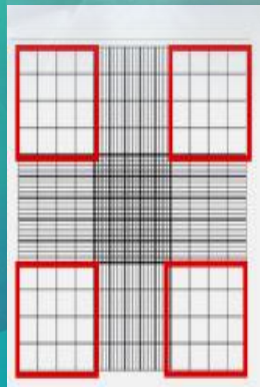


Figure 1: Hemacytometer grid

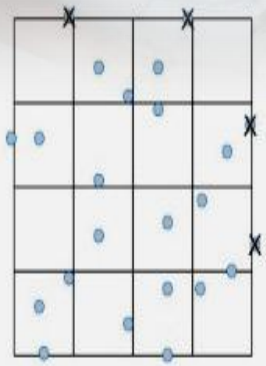


Figure 2: Cell counting guidelines

MATERIALS AND METHODS

DETERMINATION OF CHLOROPHYLL–a

-Using spectrometric method

Formula for chlorophyll-a:

Chlorophyll a

$= 11.6\ E_{665} - 1.31\ E_{645} - 0.14\ E_{630}$

The values were expressed in mg/m^3.

MATERIALS AND METHODS

Statistical Analysis

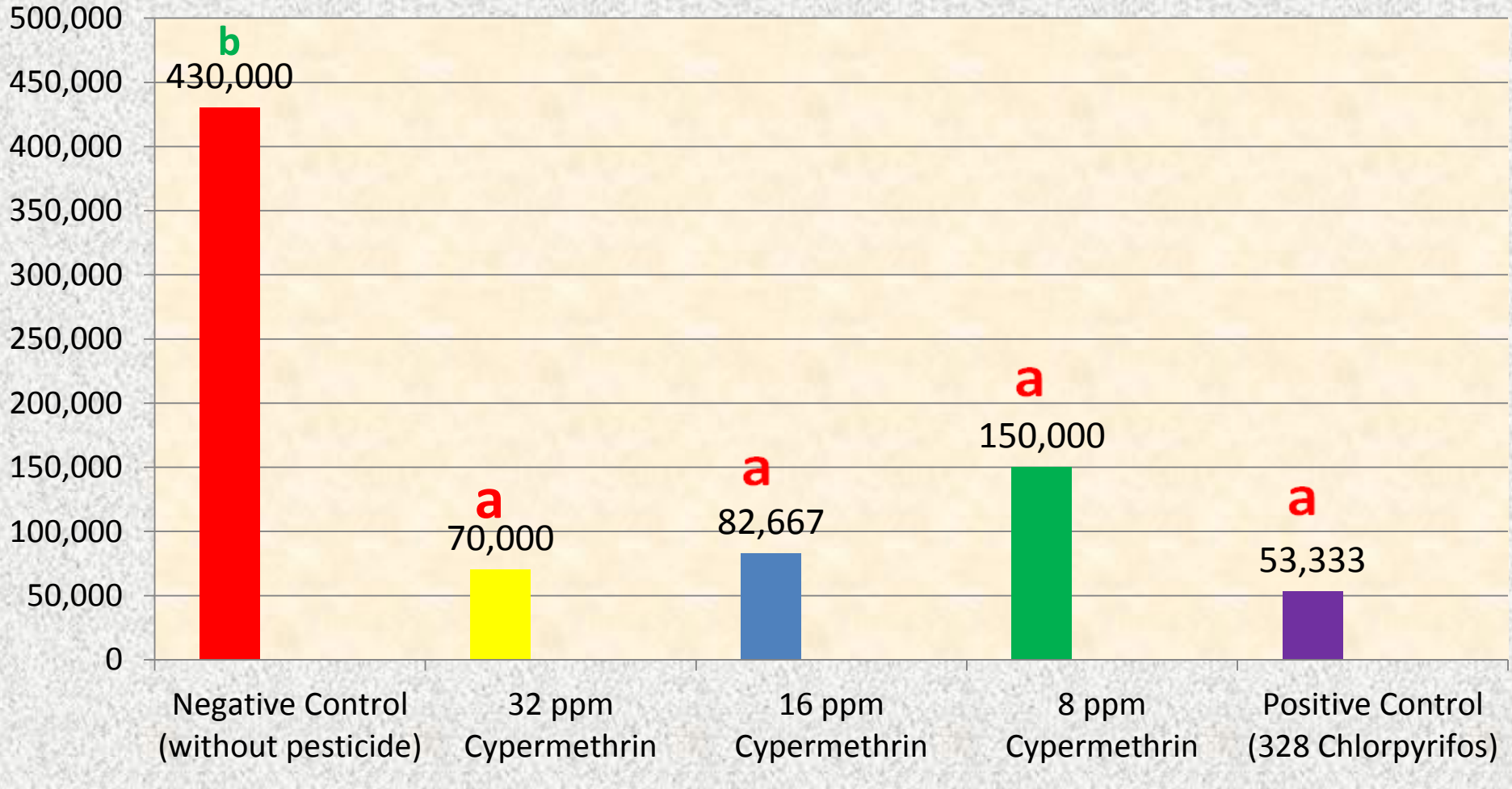
- Statistical Package for Social Sciences (SPSS) version 20.0 was used to process and analyze all the data collected.

- One Way- Analysis of Variance (One- Way ANOVA) (p 0.05) was used to determine the significant differences in the cell density and chlorophyll a content in all treatments tested.

- Duncan's Multiple Range Test (DMRT) (p 0.05) was used a Post-Hoc test to determine the significance difference between the treatments tested.

RESULTS AND DISCUSSION

Figure 1. Cell Density (cells/mL) of *Navicula* sp. exposed to the different concentrations of cypermethrin



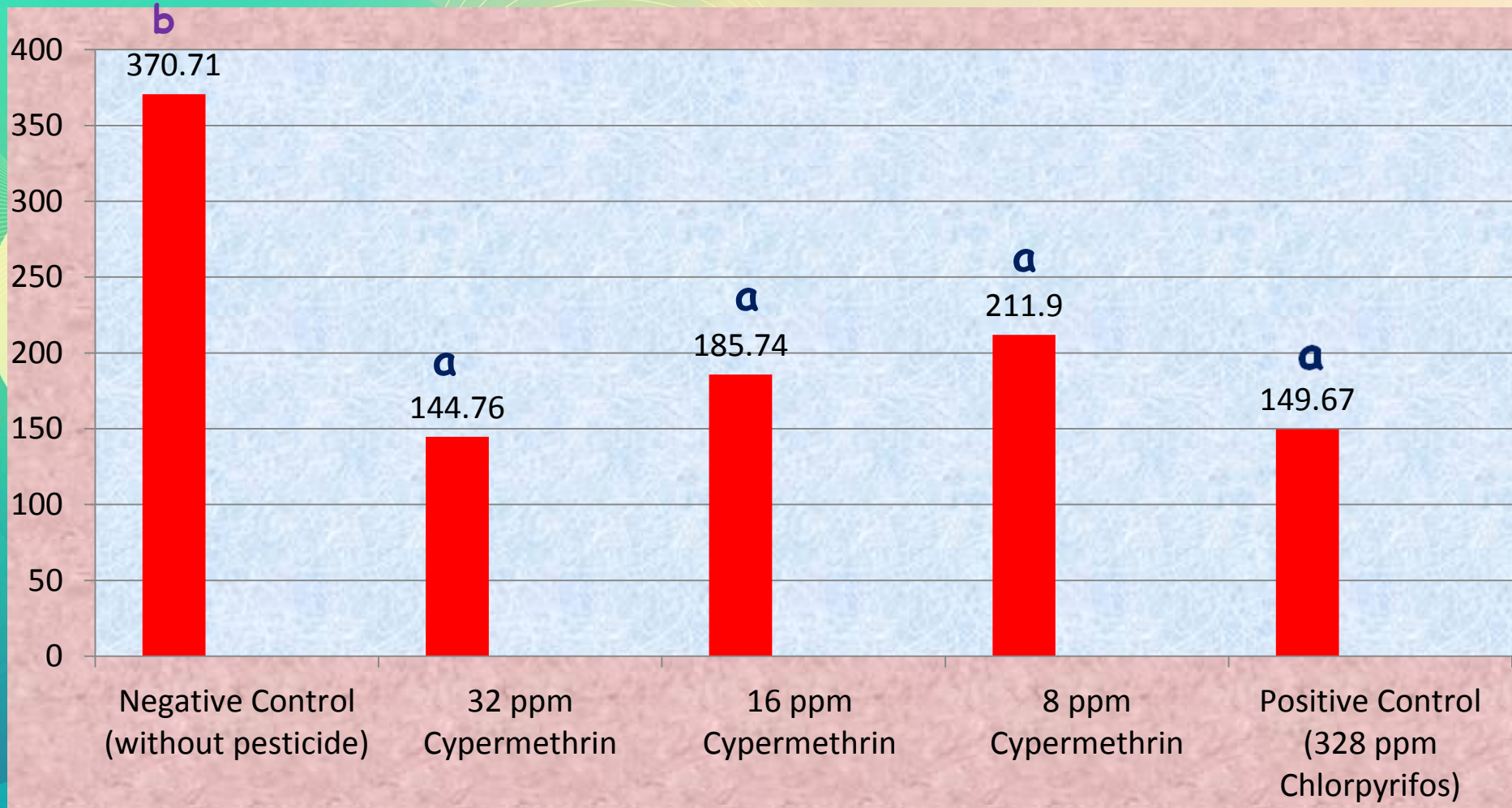
RESULTS AND DISCUSSION

Figure 2. Difference among the cell density of *Navicula* sp. exposed to the different concentrations of Cypermethrin *p<0.05*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	285906666666.667	4	71476666666.667	7.948	.004
Within Groups	89933333333.333	10	8993333333.333		
Total	375840000000.000	14			

RESULTS AND DISCUSSION

Figure 3. Chlorophyll a content (mg/m^3) of *Navicula* sp. exposed to the different concentrations of Cypermethrin



RESULTS AND DISCUSSION

Figure 4. Difference among the chlorophyll a content of *Navicula* sp. exposed to the different concentrations of Cypermethrin *p<0.05*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	102845.873	4	25711.468	4.769	.021
Within Groups	53909.608	10	5390.961		
Total	156755.481	14			

RESULTS AND DISCUSSION

Cell Density of *Navicula sp.*

- Results of the current study revealed that there was significant difference in the cell density of *Navicula* sp. among the treatments tested.
- It is indicated that the cell density of this organism decreased as the concentration of cypermethrin was increased.
- The reduction in the cell density of this diatom could be linked to the action of the cypermethrin as a pesticide.

RESULTS AND DISCUSSION

- Cypermethrin consistently inhibited the algal population growth in concentrations from 50 to 250 mg/L (Sampson and Pickett-Heaps ., 2001)

- Sampson and Pickett-Heaps (2001) observed that cytoskeleton, a cell part involved in cell division and management of the internal layout of the cell, is prone to damage, degradation and disruption once exposed to pesticides.

RESULTS AND DISCUSSION

Chlorophyll- a Content of *Navicula sp.*

- Findings of the present study showed that there was significant difference in the chlorophyll a content of *Navicula* sp. among the treatments tested.
- Chlorophyll a content of the diatoms decreased as the concentration of cypermethrin increased.
- The decline in the chlorophyll a content of this organism can be linked to the action of the cypermethrin as a pesticide itself.

RESULTS AND DISCUSSION

- The inhibition of photosynthesis of *Anabaena* by cypermethrin enhanced the degradation of pigments mainly for producing carbon skeleton to satisfy the energy demand of cells (Patra *et. al*., 2000)

- The degradation of these photosynthetic pigments could be also due to the pesticide-thylakoid membrane interaction (Mohapatra and Schiewer, 2002).

CONCLUSION

- Cypermethrin significantly reduced the cell density of *Navicula sp.* at its log phase the same way the positive control did to the diatoms.
- Cypermethrin also reduced the chlorophyll-a content of *Navicula sp.* statistically the same as to the positive control.

RECOMMENDATION

- The effects of cypermethrin on the cell density and chlorophyll-a content of *Navicula sp* should be tested in a lower dose or application.

- Investigating the effects of cypermethrin on the cell density and chlorophyll-a content of other diatoms should be done in the future studies.

- Investigating the effects of other pesticides on the cell density and chlorophyll-a content of other diatoms should be done in the succeeding research endeavor.

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