

# A study of adsorption and absorption of ammonia by moss

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## Abstract

This study focuses on the deodorizing potential of moss which has the ability to reduce unpleasant odors. Unpleasant odors can lead to physical stress in various environments. At our school, the foul smell caused by ammonia in toilets has become a serious issue. Two hypotheses were tested; surface adsorption and inner absorption of ammonia by moss. Experiments confirmed both hypotheses, suggesting moss can reduce unpleasant odors in toilets effectively. These results highlighting moss's application in sustainable odor free toilets align with SDGs six "CLEAN AND SANITATION" and ten "REDUCED INEQUALITIES" and 11 "SUSTAINABLE CITIES AND COMMUNICATION".

## 1 Background and purpose

### Background

Unpleasant odors in the Miyazaki Omiya H.S. toilets

Can moss Improve the odors?

### Purpose

Clarify the mechanism by which moss removes  $\text{NH}_3$

### Significance



### Proof of Concept

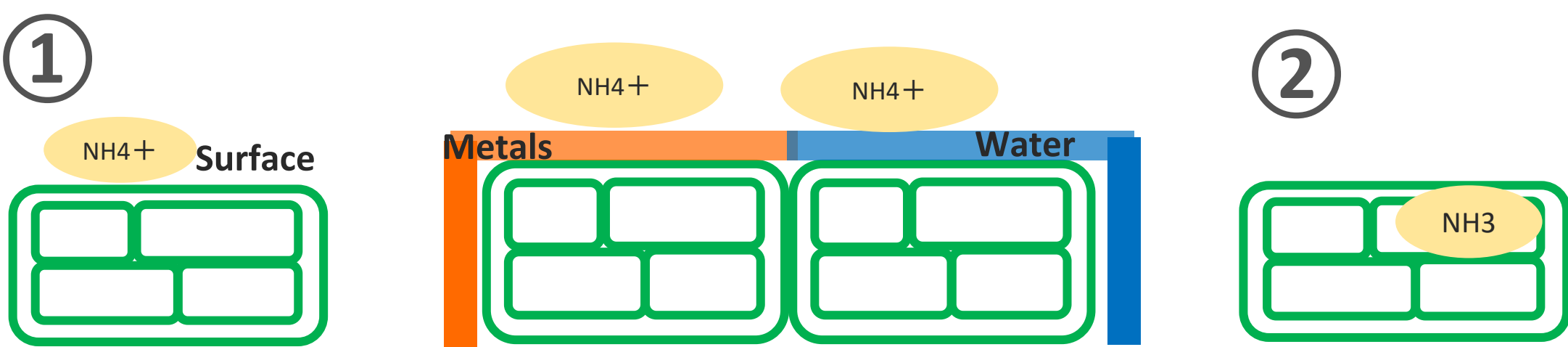
- 1 Untreated
- 2 Squeezed
- 3 Mixed
- 4 Crushed

Compare

Untreated was most effective

### Hypothesis

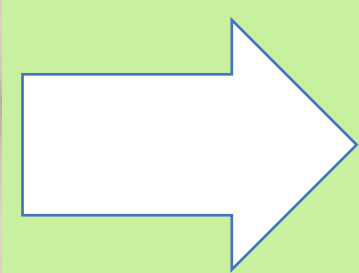
- ① Surface Adsorption
- ② Internal Absorption



## 2 Experiment1

Object: To test the adsorption hypothesis by monitoring changes in pH over time.

30min 60min  
90min 120min

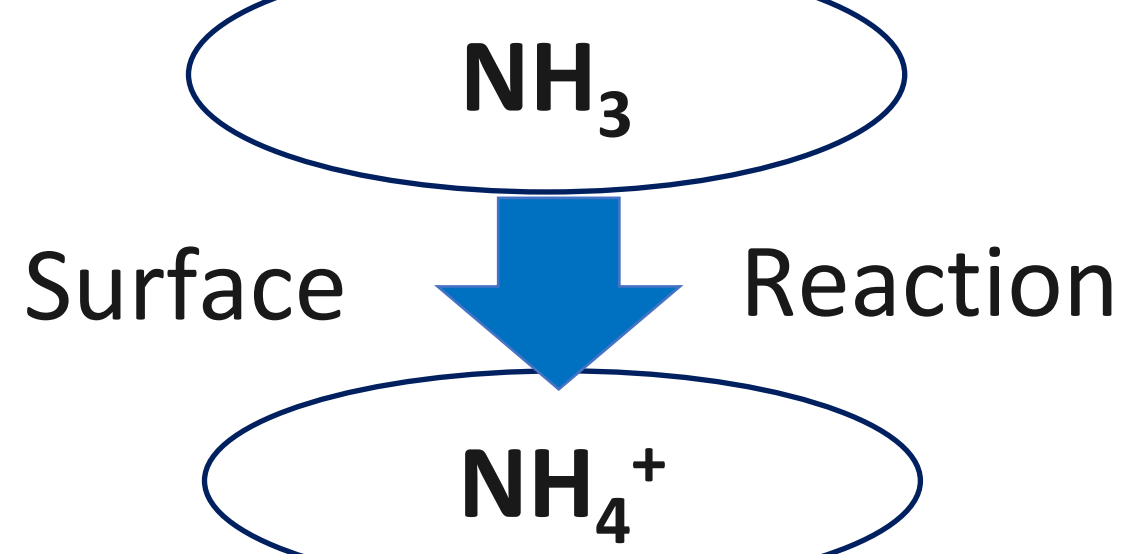


### Result1

### Interpretation 1

Time	pH
0	7.0
30	9.5
60	8.0
90	10.0
120	11.0

Increase gradually



## 3 Experiment2 (in toilets)

Point of view to evaluate

States	Natural	Placed in the toilet
Ex.		
adsorption	A	B
absorption	C	D

## Moss

### Adsorption

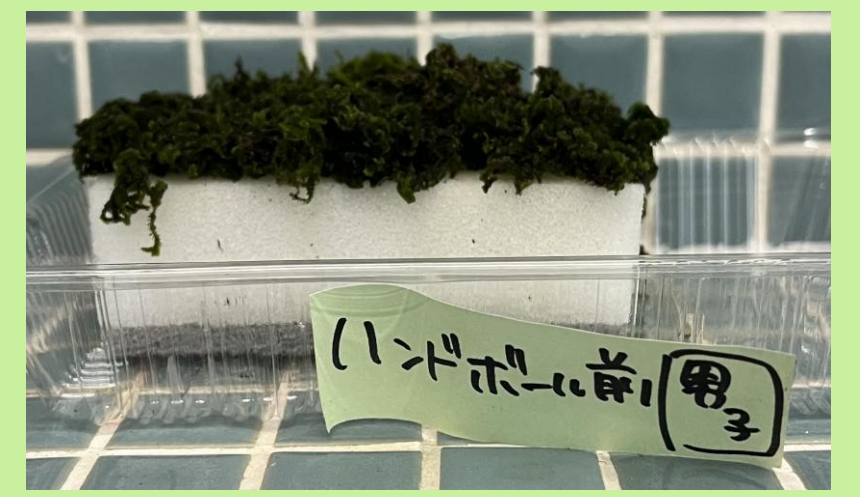
### Absorption

### Decomposition

### Extraction

### The Indophenol Method

### Nitrogen content



### Result 2

### Interpretation 2

Change in the amount of adsorbed nitrogen

A	ave	SD	B	ave	SD
			Samples' name	ppm	
	ppm		Library A	1.4	0.0
			Library B	39.1	0.6
Natural moss	0.0399	0.0299	Science building A	1.8	0.0
			Science building B	2.0	0.0
			Playground A	1.0	0.0
			Playground B	2.6	0.1

× 2.7

Change in the amount of absorbed nitrogen

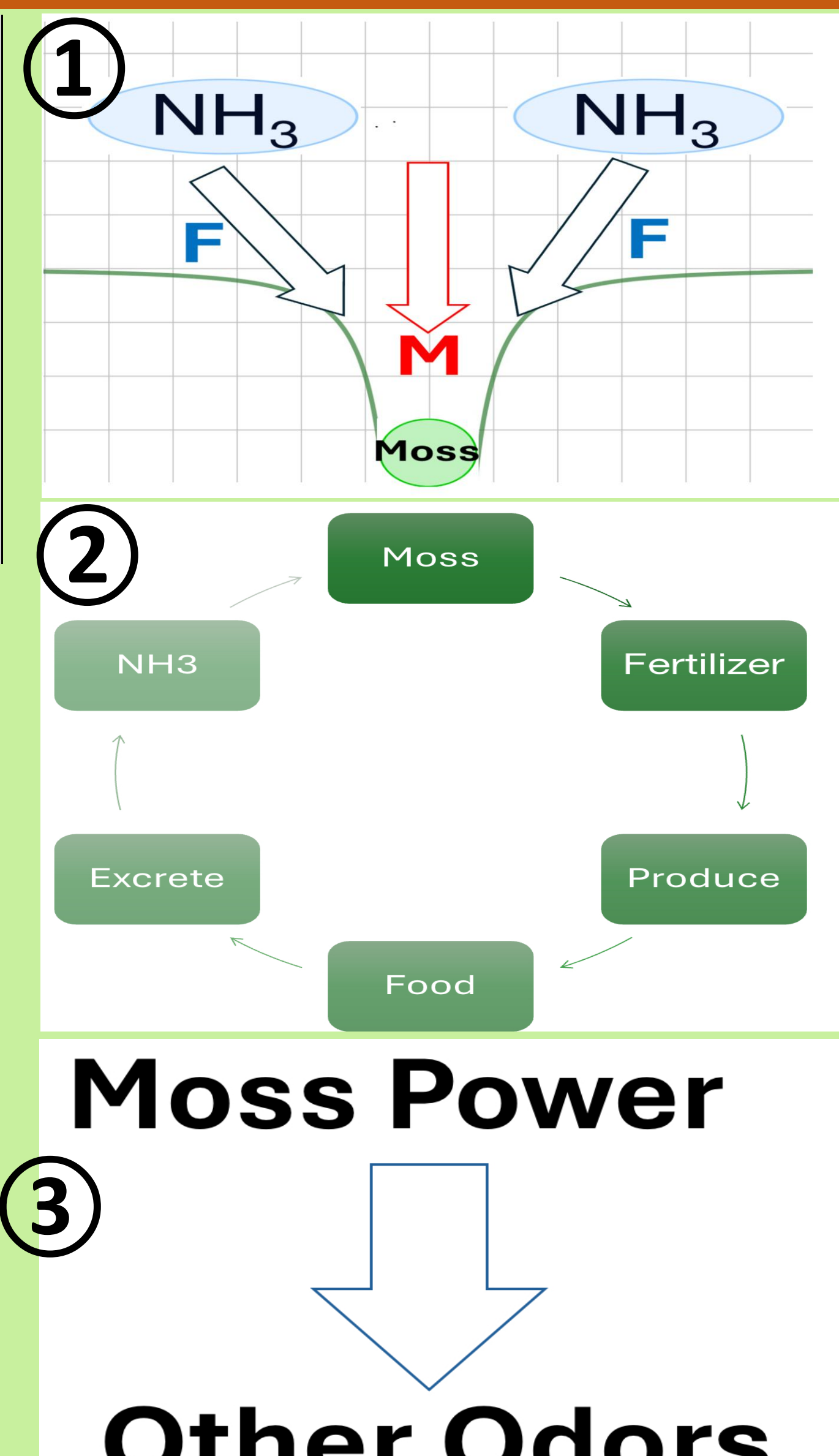
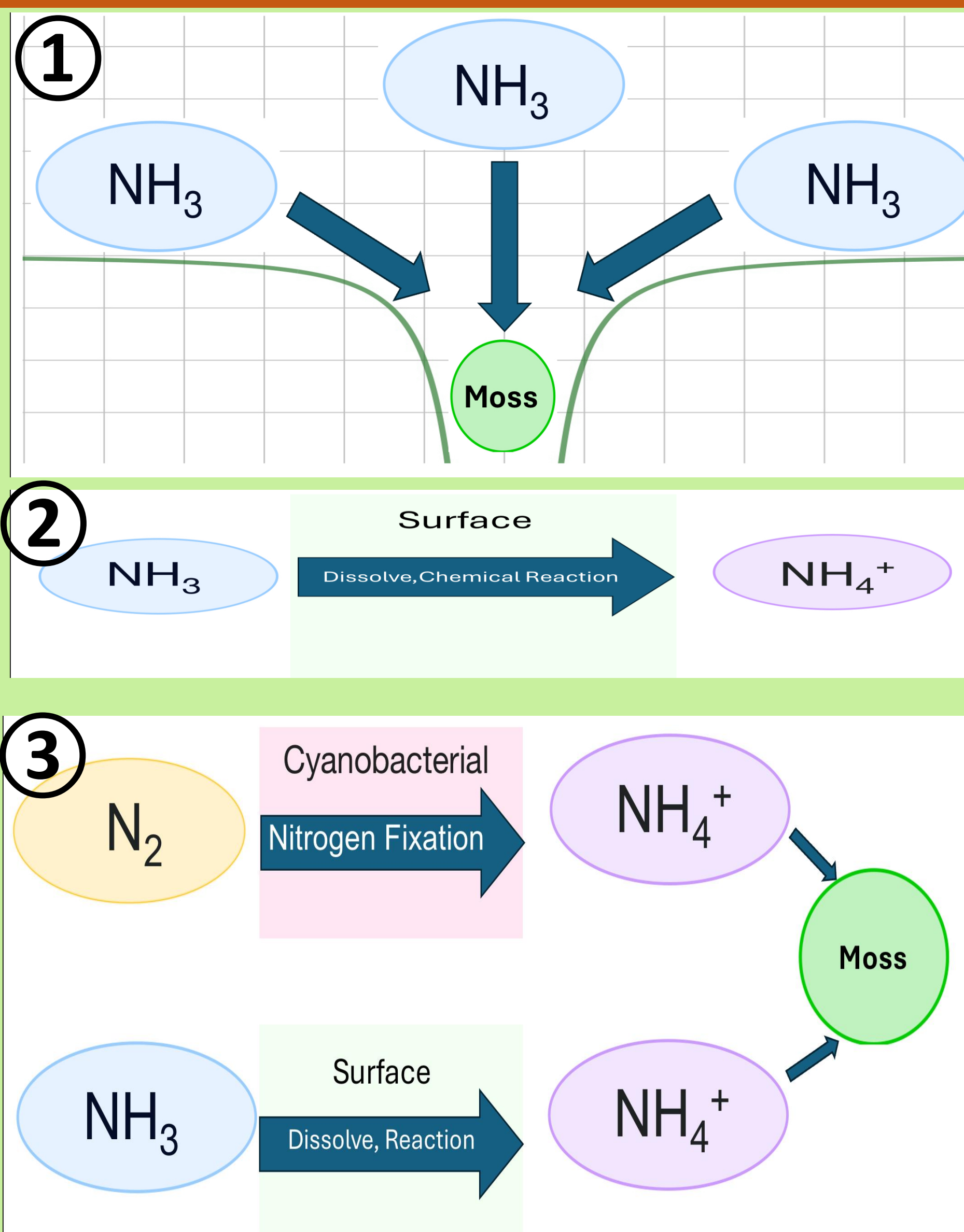
C	ave	SD	D	ave	SD
	mg/gDW		Samples' name	mg/gDW	
			Library A	24.5	1.5
			Library B	22.7	0.8
Natural moss	9.3	0.1	Science building A	23.0	1.5
			Science building B	24.4	1.5
			Playground A	22.6	2.0
			Playground B	25.8	1.1

× 44



## 4 Conclusion

## Future perspective



## 5 Acknowledgement • Citation

<acknowledge>We would like to express our science appreciation to Dr.Yamamoto Yoshiyoshi of the faculty agriculture, University of Miyazaki, as well as to all those to assisted us in our research.Thanks  
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