9. Venus Flytrap

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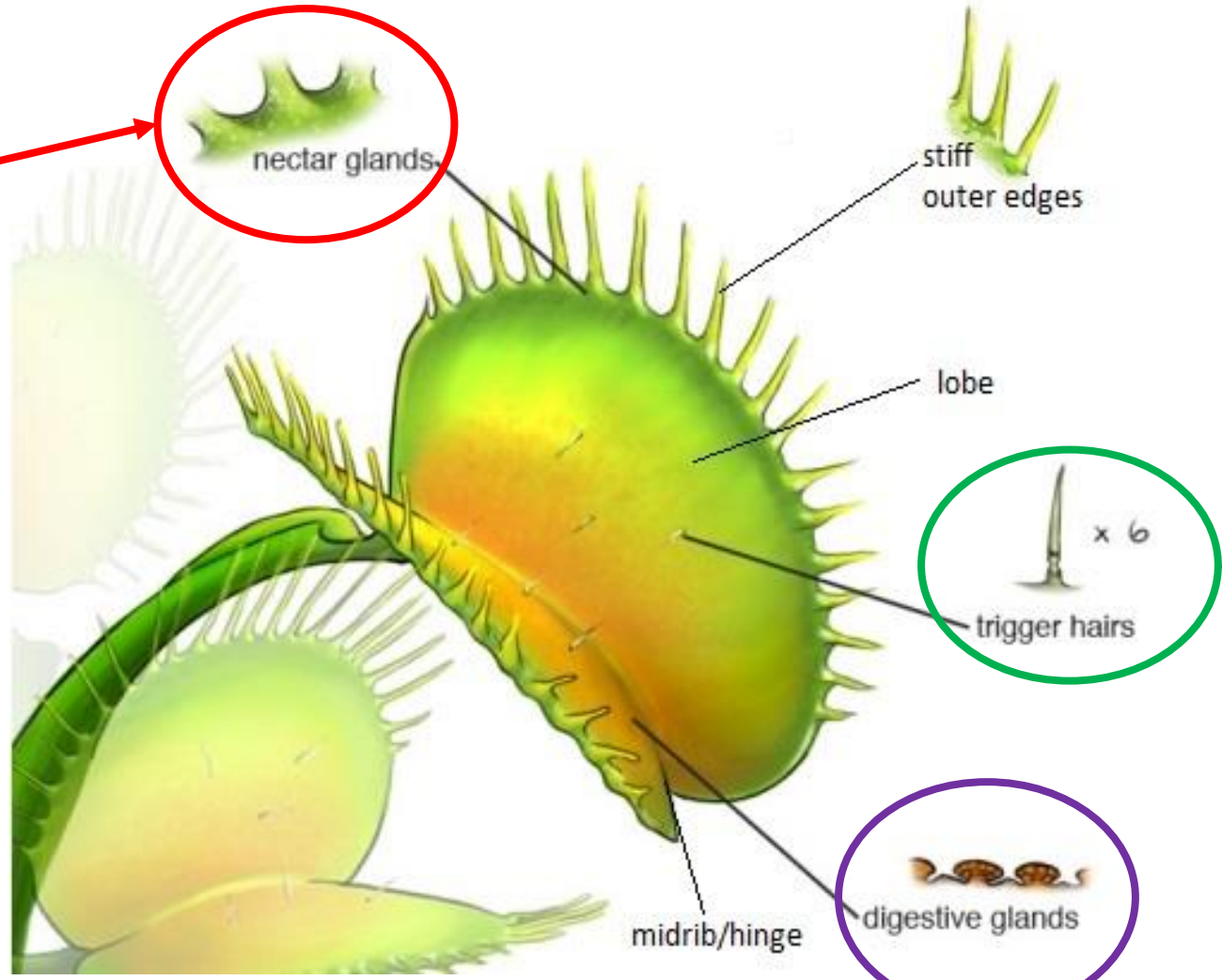
Task

Investigate experimentally how Venus flytrap (Dionaea muscipula) catches and digests its prey.

- Find and investigate the catching mechanism
- How does the digestion work?
- What is it's prey?

Theory – Venus Flytrap parts

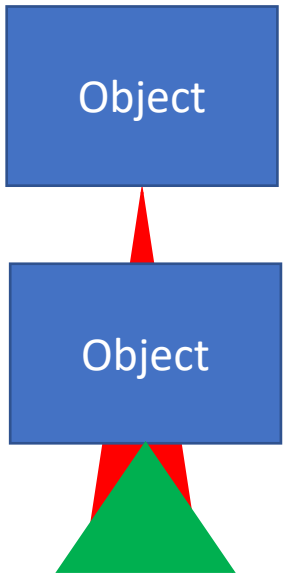


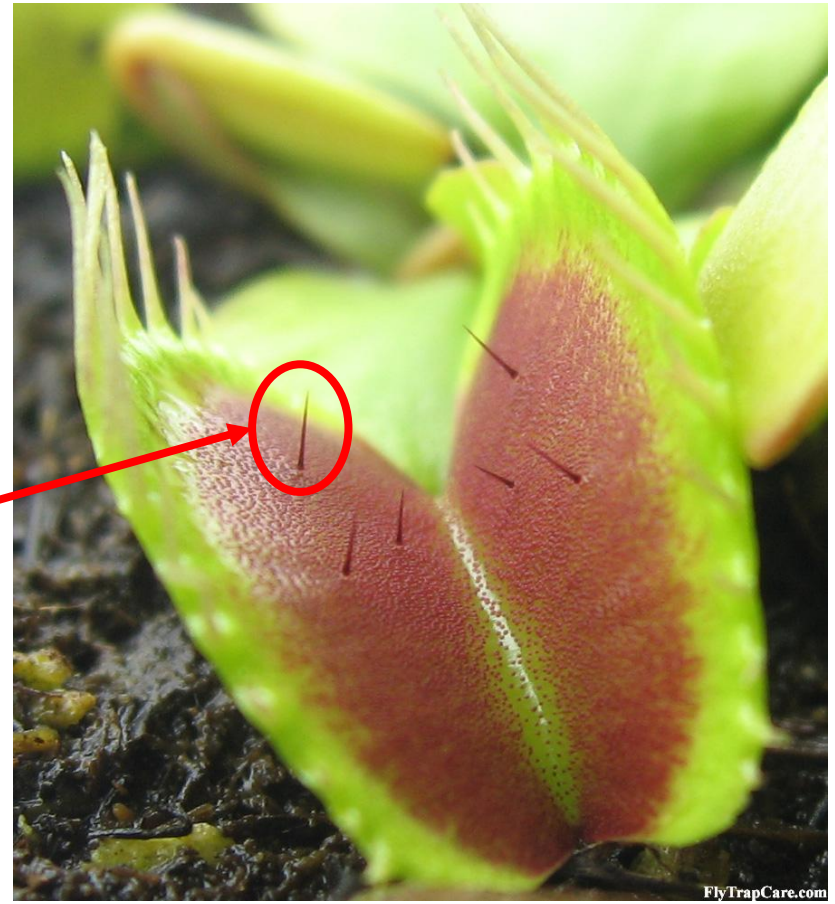
Attract prey

trichomes

Theory – Trigger Hairs

- The object touches the trigger hairs twice and the plant closes
- Change in pressure for cells



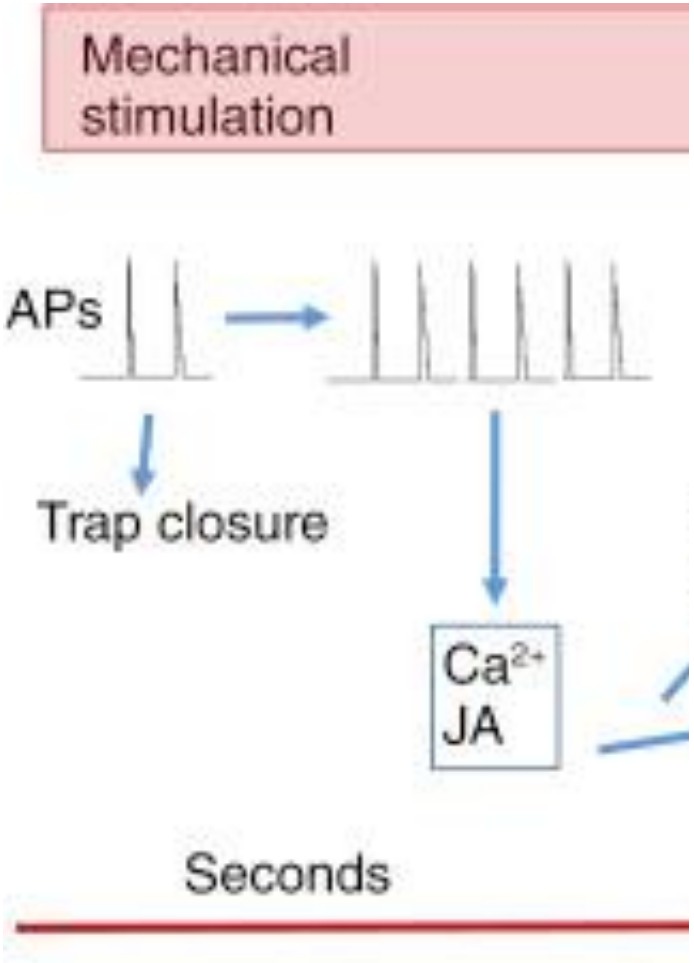


Theory - Digestion

Object touches trigger hairs

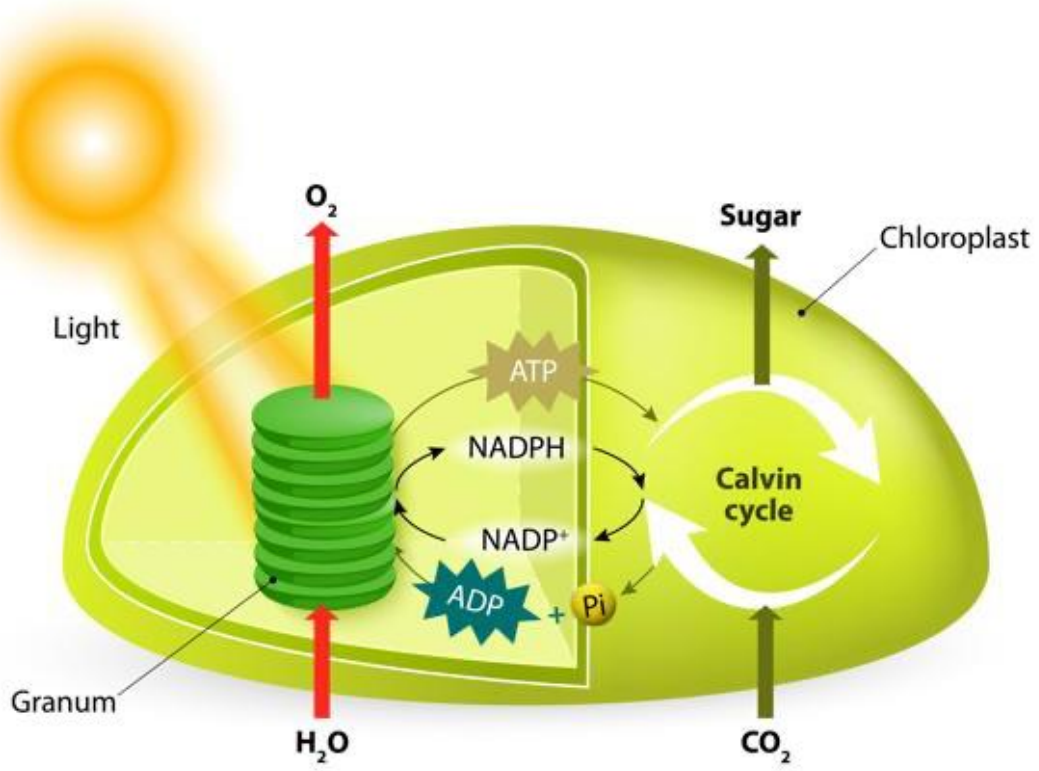
Trap Leaf Closure Sequence

Theory – Chemical Process



Theory - Diet

- Mostly ants
- Insects
- Sometimes tiny frogs
- Also need water, gas and sun



Materials

- Venus flytrap
- Food: Procellio Scaber (rough woodlouse), Drosophilidae (fruit flies), *Halymorpha halys(stink bug)*
- Thermometer
- Hygrometer
- Microscope
- pH– Tests

Set - Up

- Light: sunlight, next to window
- Humidity: Ø 55%
- Temperature: 21 degrees celcius
- Fertilizer: none
- Earth: unchanged and store bought
- Water: Rainwater, every four days 2cm high

Experiment 1 – Feeding the plant

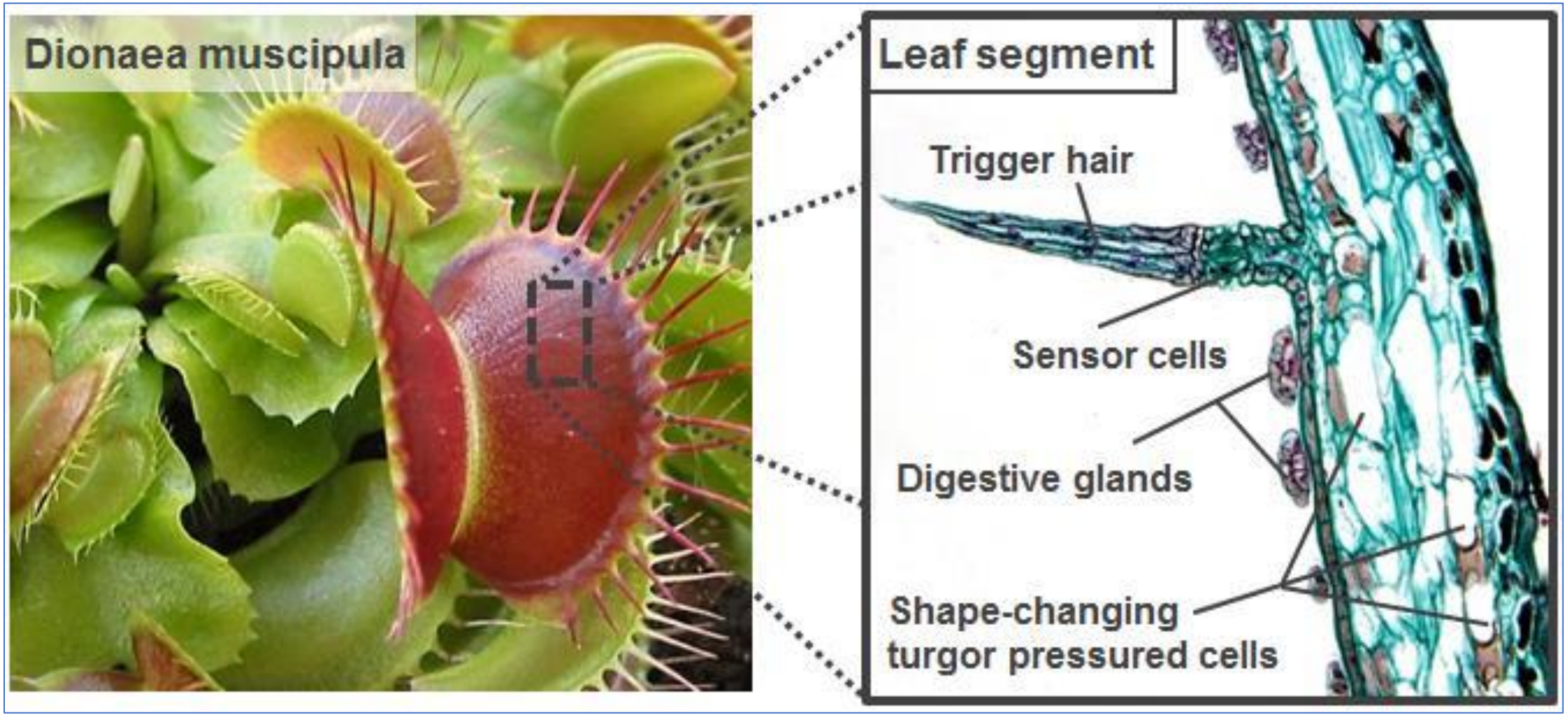
- Feed (rough woodlouse), 5 plants
- Observations:
  - closes when the Insect touched two trigger hairs
  - After 5min the plant closes
  - Only closes when the prey is heavy enough
- The plant closes, so the Insect cannot escape

Experiment 2 – amount of reaction time

- Touched the trigger hairs with a toothpick
- Observations:
  - Only closed, when the second touch was within 30sec

- The plant can test if it is really an Insect and not a dead object

Experiment 3 - Microscope



Experiment 4 - Digestion

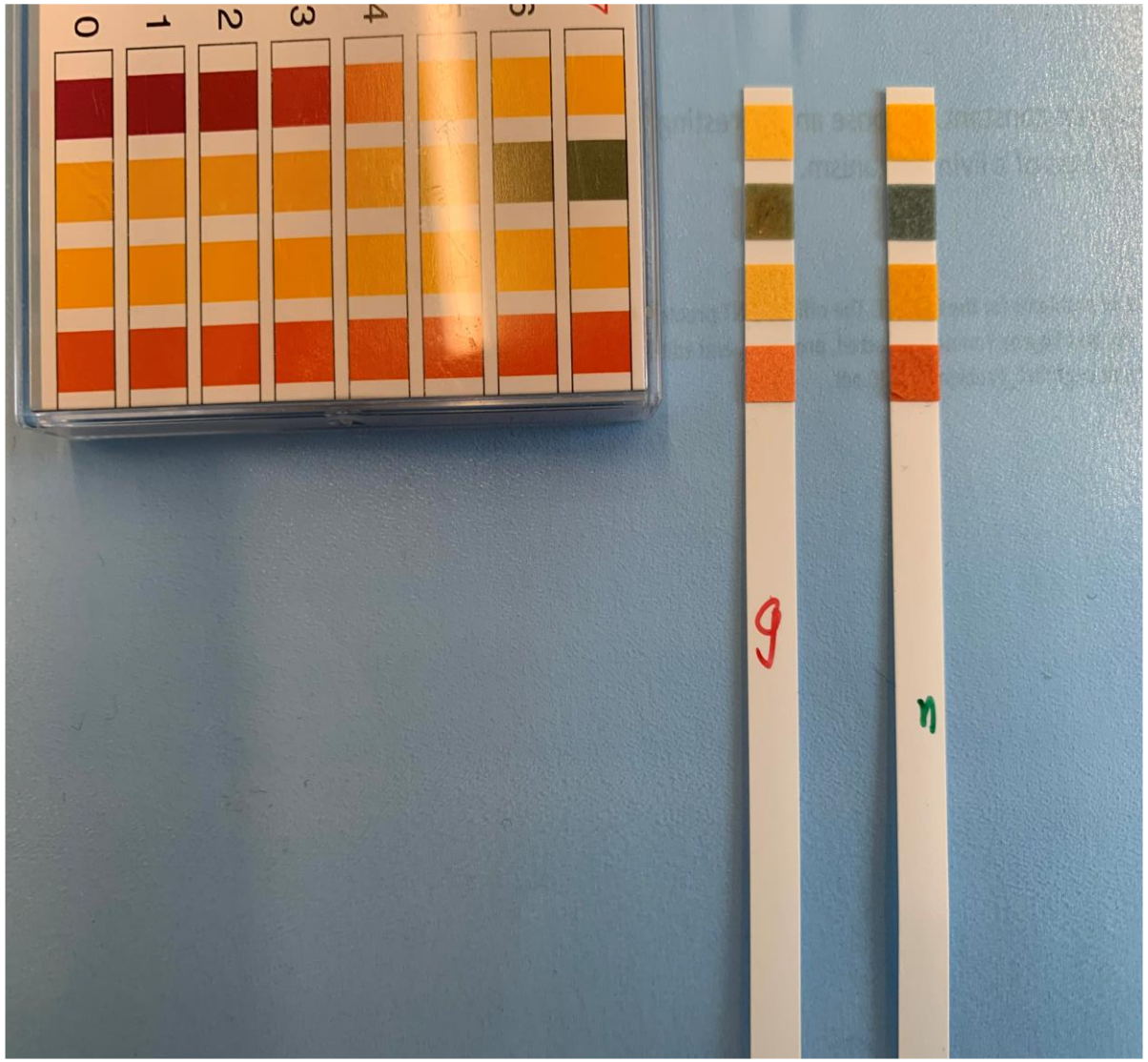
- Plant without anything (control)
- Plant with rough woodlouse (alive)
- Plant with cockroach (dead)
- Plant with worm (alive)
- Plant with wood bead (object)

➢ Acid production

➢Plant can differentiate between dead and alive

Experiment 5 – pH Measurements

Fed Plant, pH 6



Not fed plant, pH 7

Experiment 6 – After Digestion

- Plant with rough woodlouse (alive)
  - Plant opened with digestion after 21 days
  - Still saw the exoskeleton
- Plant with cockroach (dead)
  - Plant opened without digestion after 2 days
- Plant with worm (alive)
  - Plant died after 3 days
- Plant with wood bead (object)
  - Plant opened without digestion after 2 days

Conclusion

Reaction time, catching mechanism

Experiment 1 and Experiment 2

Distinguish dead and alive

Digests parts of insects

Experiment 4 and Experiment 6

The pH of the acid in the digestion changes when fed

Experiment 5

References

- Holistic design and implementation of pressure-actuated cellular structures (Abb.4, Folie 13)
- Digestive Section of Dionaea muscipula (Venus‘s-Flytrap)
- Universität Würzburg, Dionaea: Wie die Verdauung in Gang kommt
- Backyard Brains, Experiment: Elektrophysiologie an der Venusfliegenfalle
- Chemieunterricht.de

Thank you for the collaboration!

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