

The Anti-bacterial Power of Agave

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What is Agave?

- A kind of Monocotyledon that is distributed in Latin America
- Categorized into Asparagales , **Agavaceae**
- Its form is similar to Aloe because they have evolved in parallel evolution.
- * As a side note, Aloe is categorized into Asparagales, **Asphodelaceae**
- * It is said that **Agavaceae and Asphodelaceae are closely related.**



Figure 1: Aloe used in the experiment



Figure 2: Agave used in the experiment

Motives and objectives

- Agave hasn't been studied much, and there is little literature on this.
- The goal is to **reveal their properties** even a little.
- Aloe is known to have antibacterial effects against Bacillus .
- Are there **similar anti-bacterial effects on the closely related Agave?**

Method

Preliminary Experiment

1. Investigate the pH and viscosity of the Agave and Aloe.
→ **Agave** pH: around 6 (weak acidity), viscosity: low
Aloe pH: around 4.5 (acidity), viscosity: high
2. Put the Bacillus into the Microtubes and centrifuge them at ① 6000 rpm for 15 seconds and ② 6000 rpm for 30 seconds. ① and ② are applied to the agar medium in 500μl. Culture them in the incubator at around 25°C and 80% humidity for 2 days.
→ They grew all over the medium.
(We determined them to be **culturable** bacteria.)
- * E.coli was determined to be **culturable** bacteria because it was already incubated.

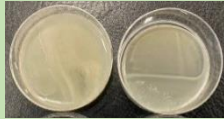


Figure 3: (left) Bacillus ①, (right) Bacillus ②

Experiment #1 Bacillus

1. Put the supernatant of the Bacillus solution into a Microtube and centrifuge them at ① 6000 rpm for 15 seconds and ② 6000 rpm for 30 seconds.
2. Smear ①, ②, ③[1/10 dilution of ①], ④[1/50 dilution], and ⑤[1/100 dilution] all over the agar medium. And put a paper disc soaked with the Agave's leaf juice and the epidermis in the center of the Petri dish.
* Do the same for Aloe.
3. Culture them in the incubator at around 25°C for 1 to 2 days.

Experiment #2 E.coli

1. Using JM109 bacterial solution, make ①[undiluted solution], ②[1/10 dilution of ①], ③[1/50 dilution], and ④[1/100 dilution] without centrifugation.
2. Smear ①, ②, ③, and ④ all over the LB medium and put the same as in experiment #1.
3. Culture them in the incubator at around 25°C for 1 to 2 days.

Result

Table 1 : Reaction to Bacillus and E.coli

Bacillus		①	②	③1/10 dilution	④1/50 dilution	⑤1/100 dilution
Agave	epidermis	—	—	—	/	/
	leaf juice	△	—	+	△	△
Aloe	mesophyll	—	/	/	/	/
	leaf juice	※ ±	—	—	—	—

E.coli		①	③1/10 dilution	④1/50 dilution	⑤1/100 dilution
Agave	epidermis	—	—	/	/
	leaf juice	—	—	+	+
Aloe	mesophyll	—	/	/	/
	leaf juice	—	—	—	—

' + : Positive △ : difficult to conclude
' - : Negative / : No data

1. Formation of inhibition circles for Bacillus and E.coli in leaf juice
→ **There is an anti-bacterial effect on leaf juice.**

→ **There is no anti-bacterial effect on epidermis.**

→ **There is no anti-bacterial effect on epidermis.**

3. No inhibition circle was observed for aloe

→ **No anti-bacterial species exist.**

* In Bacillus ④ and ⑤, the bacteria were not uniform and it was not possible to determine the presence or absence of inhibition circle.

* There was a sample in which an inhibition circle was not formed for Bacillus ①.

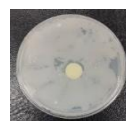


Figure 4: Agave leaf juice Bacillus ③ 1/10 dilution

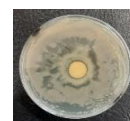


Figure 5: Agave leaf juice E.coli ③ 1/50 dilution



Figure 6: Agave leaf juice E.coli ④ 1/100 dilution

Consideration

1. Anti-bacterial effect on the leaf juice of Agave
→ **It may be able to inhibit bacterial erosion from the world.**
2. No inhibition circle on the epidermis of Agave
→ **The epidermis doesn't play a role against bacteria**
3. Aloe sometimes didn't have a inhibition circle
→ **Aloe may have varying in anti-bacterial effect depending on species and growing environment.**

Future Outlook

1. Identify **the substance that is the source of the antibacterial power.**
2. Discover which organ makes the substance (**tracking the stream of the substance**).
3. Research **how antibacterial power differs depending on temperature.**
4. Discover **relationships between growing environment and antibacterial power.**
5. Verification of differences in antibacterial power between different species of Aloe.
6. **Quantifying the antibacterial powers.**
7. Discover whether the Agave have the antibacterial power against the other bacteria.

References

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