

How does sound affect the growth of plants?

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Background and Purpose

It is said that plants grow well when exposed to sound(classical music etc.). Also, in previous research^{[1][2]}, it was recorded that white radish sprouts[*Raphanus sativus*] grow best comprehensively when exposed to a sound of 2000Hz, but it's mechanism wasn't clarified. So, we aimed to clarify it is true that plants grow well when exposed to sound and the mechanism involved in how sound affects a plants' growth if they grow well.

Hypothesis

We predicted that auxin(IAA)'s movement in plants will be improved by playing a sound of 2000 Hz, and the plants will grow well.

Experiment Method

①Definition :

Grown length =Extension of coleoptile

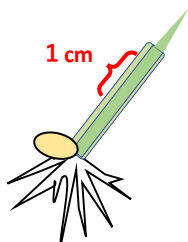
Extended length=(Mean of the length after this experiment)
—(Mean of the length before this experiment)

②Control condition : A=No sound · No IAA, B=2000 Hz · No IAA
C=No sound · With IAA, D=2000 Hz · With IAA

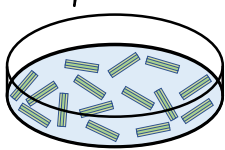
③Procedure

Sample...*Avena sativa*

① Grow *Avena* in red light for about 3 days. And cut a 1cm sample of 3mm from the edge. Measure these *Avena* with the calipers. ^[3]



② Put natural water and 15~20 of ①'s *Avena* in a Petri dish. Repeat and put IAA 0.10mg/L, 0.15mg/L, 0.20mg/L & 0.25mg/L instead of the natural water.



③ Do control experiment (Sound[2000Hz] or No sound) for 3~5 hours in an incubator.



Result

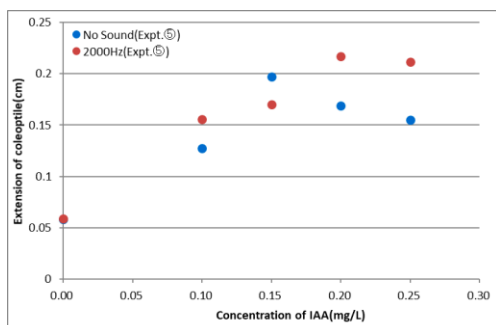


Figure1 : Relationship between extension for 3 hours and concentration of IAA

Conclusion

There is a high probability that the sound promoted the movement of auxin in plants and the growth of them.

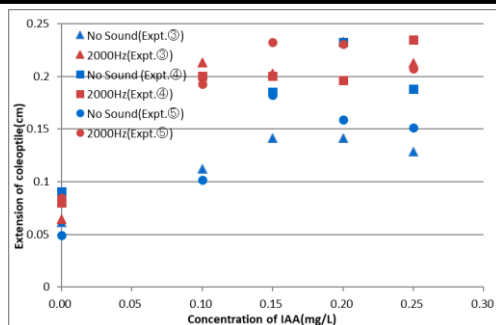


Figure2 : Relationship between extension for 4 hours and concentration of IAA

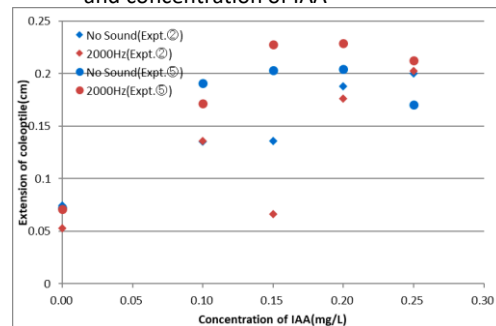


Figure3 : Relationship between extension for 5 hours and concentration of IAA

Discussion

Considering errors in temperature in the incubator and individual differences, the results are summarized in the following table. (Table 1)

Table1:The summary of experiment

	No Sound	2000 Hz
No IAA	A. Extended a little	B. Extended a little
IAA	C. Extended normally	D. Extended well

- Regarding relation between sounds and extension
C&D→It can be said that it was well extended by sound
- Regarding the mechanism
A&C · B&D→ It can be said that auxin has a function to extend well
A&B→Without auxin, It can be said that it doesn't extend even with sound

Future prospects

We'd like to improve the experiment because we could not do accurate statistical processing. Also, We'd like to find out detailed mechanism and the affect by other plant hormone.

References lists

- [1] Sumika, Inoue; Kazuki, Kobayashi; Kenshi, Tsujimoto; Chiho, Hayashi; Kana, Harada; Ayaka, Yamamoto; Nao, Yoshida. Shokubutsu no Seicho to 'Oto'. Hyogo Pref. H. S., 2012, (Japanese).
- [2] Shiho, Tamasawa; Nanami, Toyama; Nahoko, Tomida; Riho, Yamashita. Shokubutsu no Seicho to Oto —Kaiwaredaikon no Seicho ni Oto ga Ataeru Eikyo—. Hyogo Pref. H. S., 2016, (Japanese).
- [3] "Shokubutsu Horumon no Bunsekiho (2)". J-STAGE. https://www.jstage.jst.go.jp/article/kagakutoseibutsu1962/17/2/17_2_114/_pdf/-char/ja, (Japanese), (accessed 2018-12-06).
- [4] Takahito, Suzuki. "Shokubutsu Horumon no Tankyu". PHOTO SCIENCE Seibutu Zuroku. 3rd ed., Suken Shuppan, 2018, p.199.