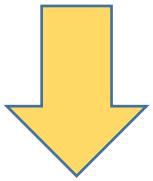
Development of new materials made from agar

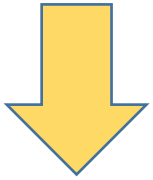
Motive

Environmental pollution

New biodegradable materials

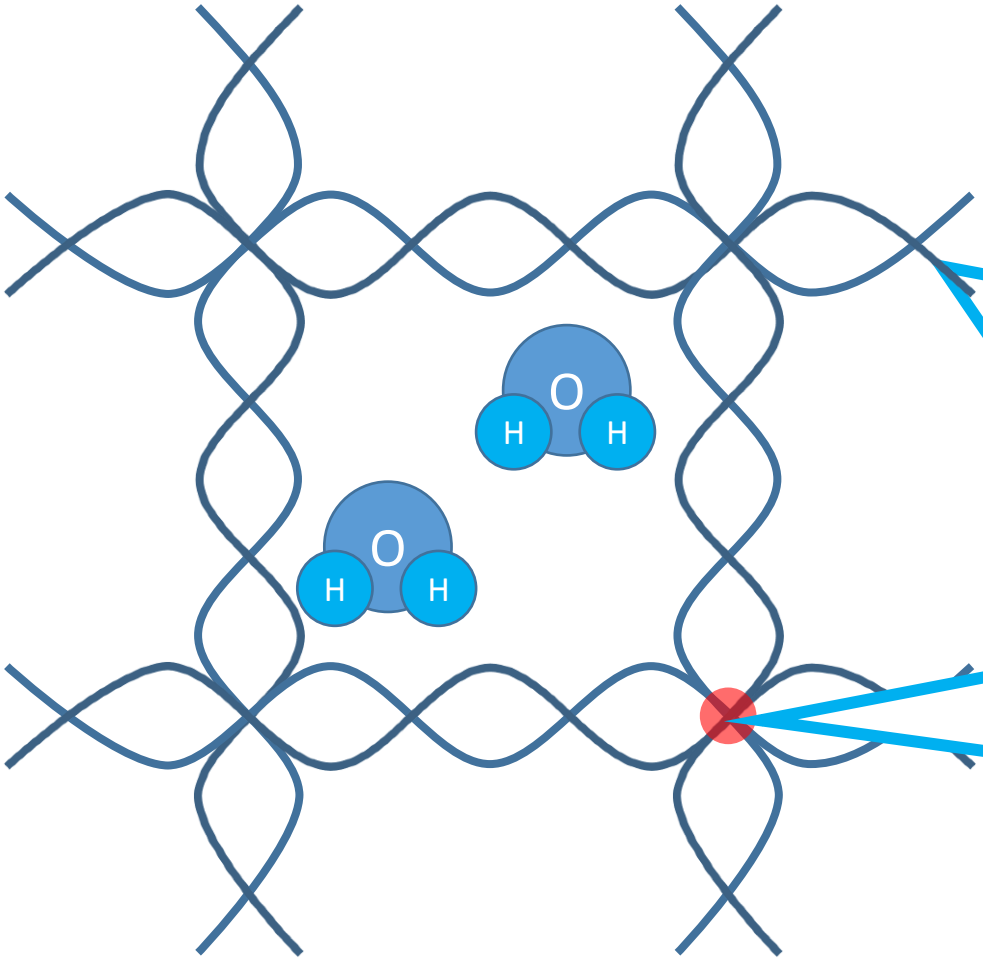


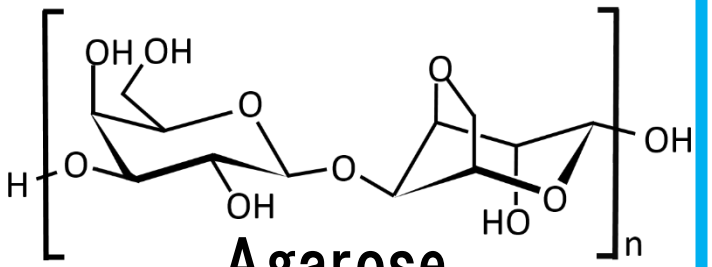
Strengthen; add fiber



Durability tests

Biodegradability tests





Agarose

A polymer made up of repeating units of galactose

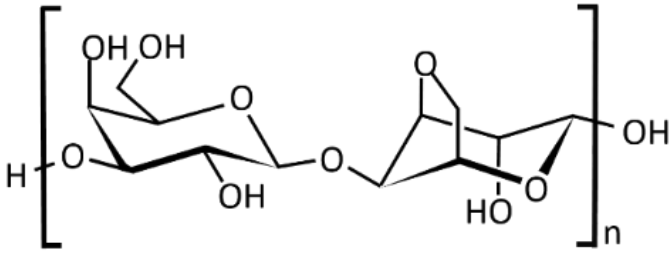
Cross linking points

make agar sheets stronger

Previous studies

To make stronger sheets…

- Add salts
  (Such as $CaCl_2$)
- Turn -OH into CH_3CO-

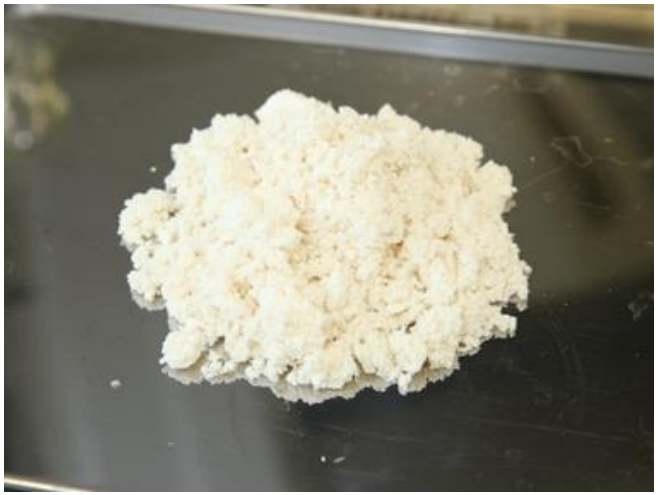


Development
as packing material

Previous study

- FRP（Fiber-Reinforced Plastics）

Add fiber to plastics to reinforce



←Fluorene-cellulose
(Osaka Gas Co.)

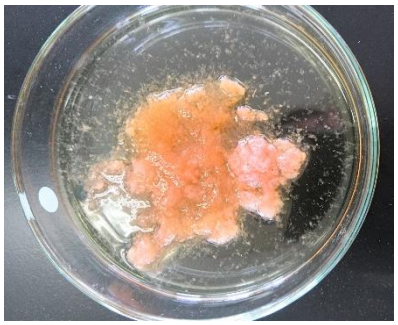
Keywords

Durability・・・ How much weight agar sheets can withstand

Biodegradable・・・Able to be changed naturally by bacteria into CO_2 and H_2O

Method： Making Sheets

① Mix ***agar powder*** and ***additive (tomato fiber, chitin)***



tomato fiber

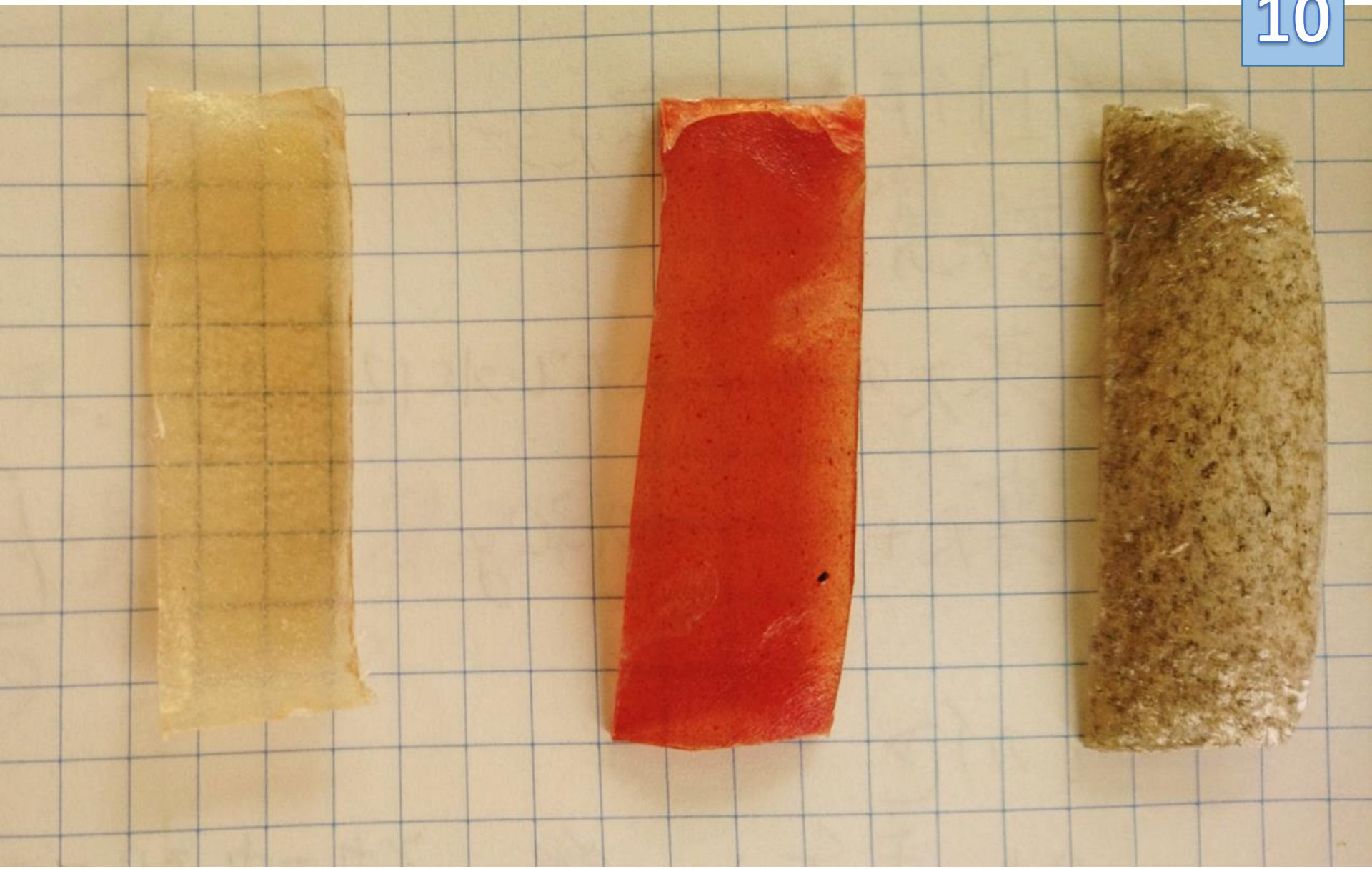
chitin

② ***Boil at 100 degrees***

③ Pour ② into plate

④ Dry

② Mixing agar while heating it



Durability test

Made three sheets below and did durability tests

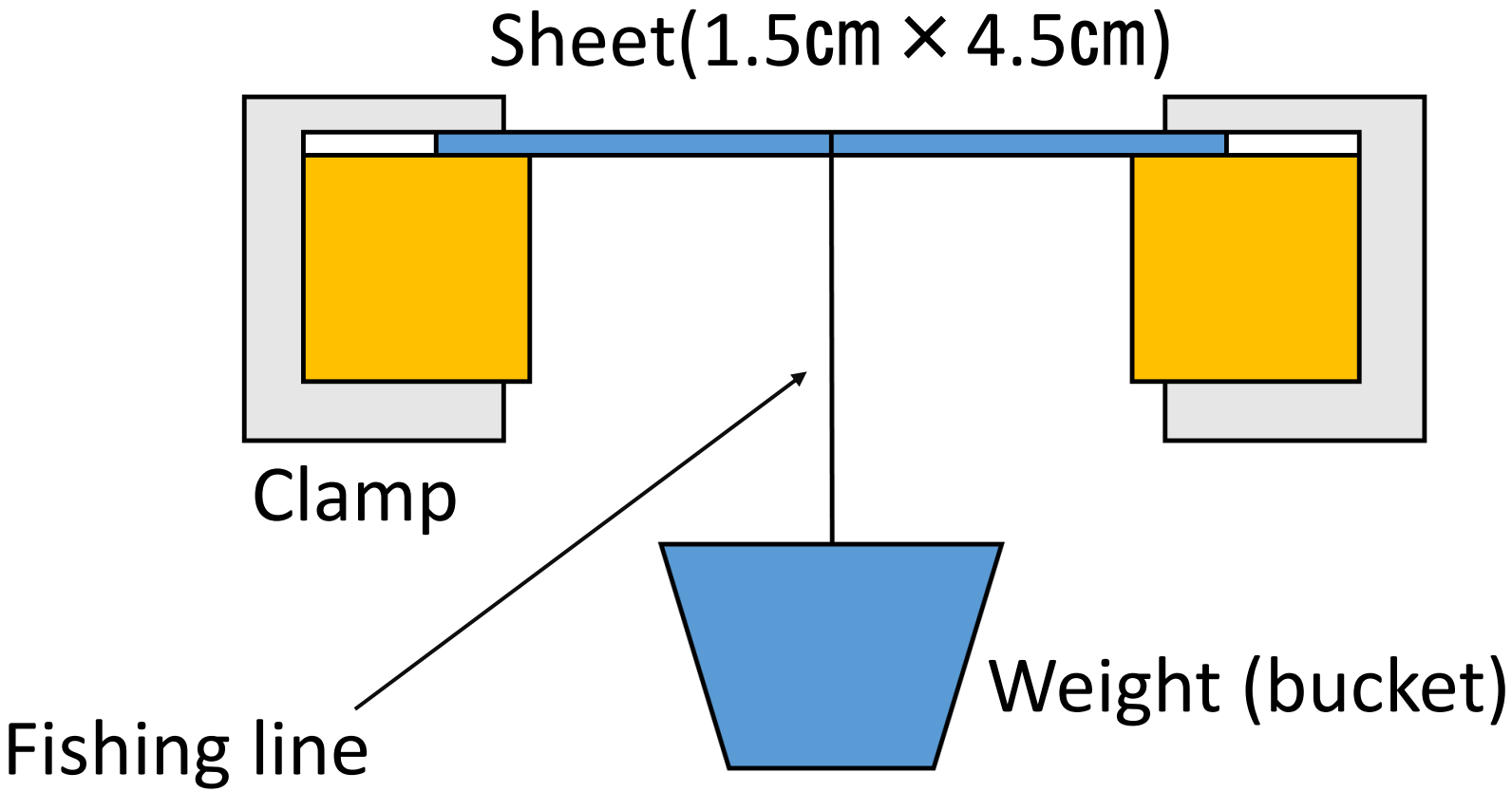
Agar

Agar + chitin

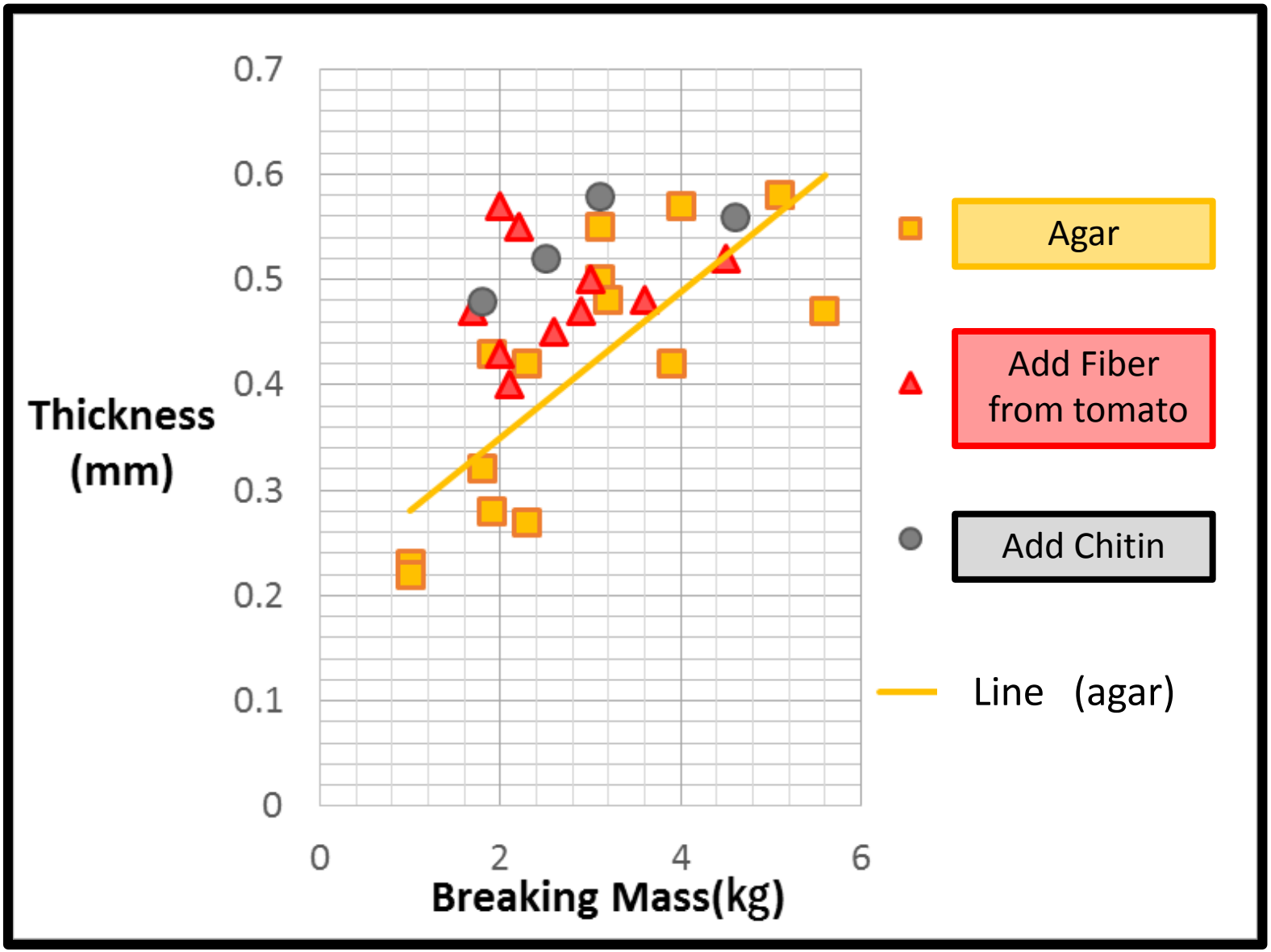
Agar + tomato

- agar 5.0g + water 90ml
- Dry in 40 ℃ stainless steel plates

Durability test device



Durability test



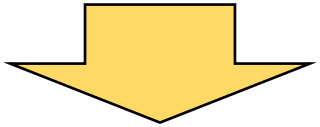
Result

- Thickness and durability are positively correlated for Agar .
- There is no correlation seen between thickness and durability for Agar + chitin or Agar + tomato .
- We can't find any differences among the three sheets.

We couldn't improve the durability of agar sheets!

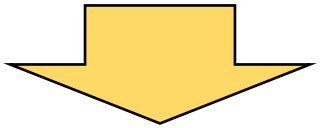
Analysis

Chitin and tomato fiber are so large
that they didn't combine with agar fiber.



Break chitin and tomato fiber into pieces

There were many errors.



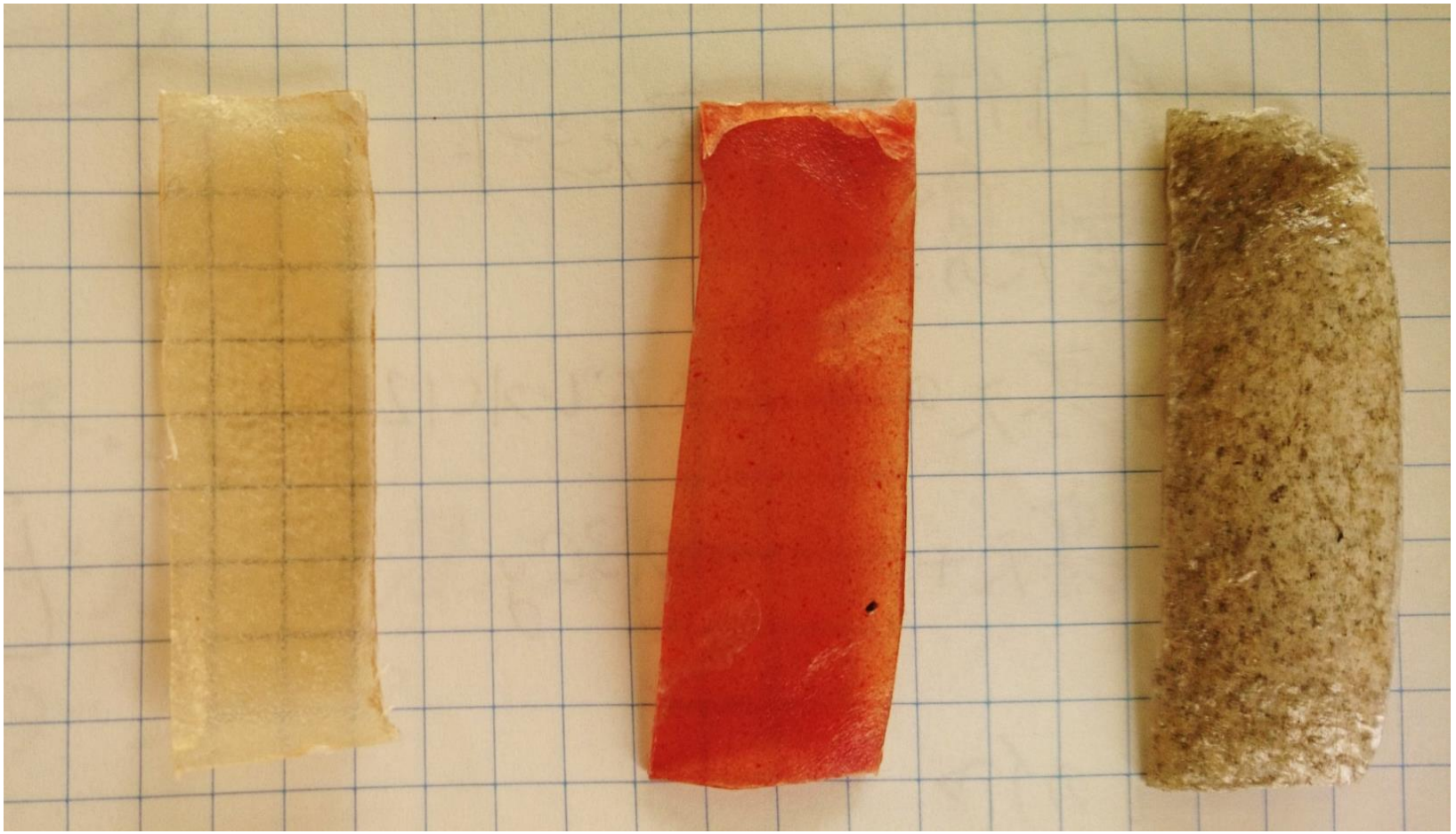
Develop a more accurate durability test device

Biodegradability Test

- Put sheets in soil
- Observe changes in mass and appearance

Biodegradability test setup

Before beginning test



Agar

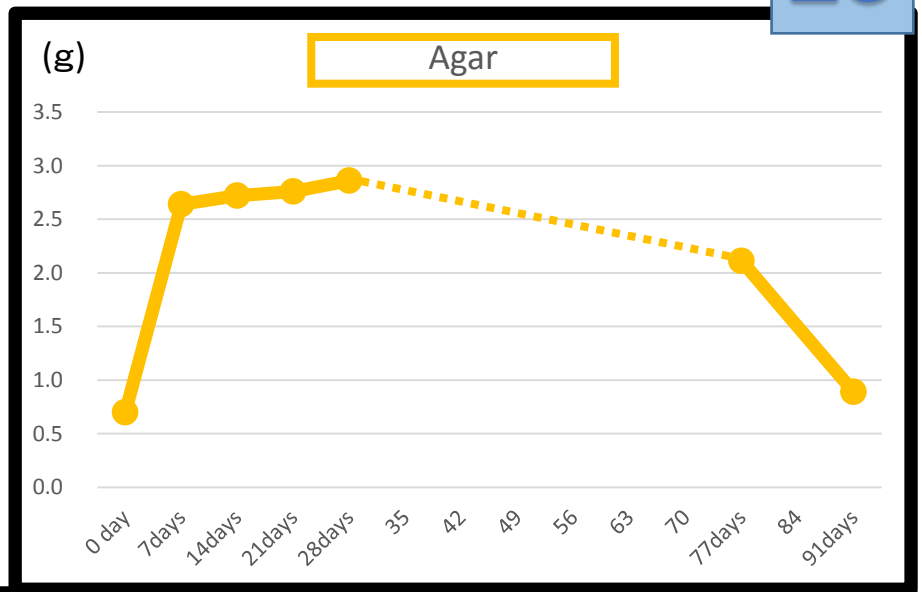
Agar + tomato

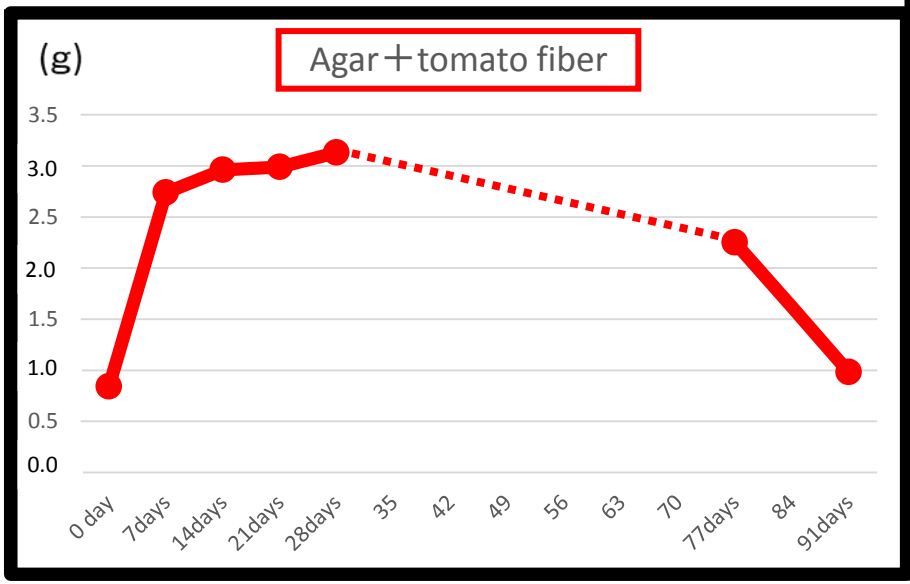
Agar + chitin

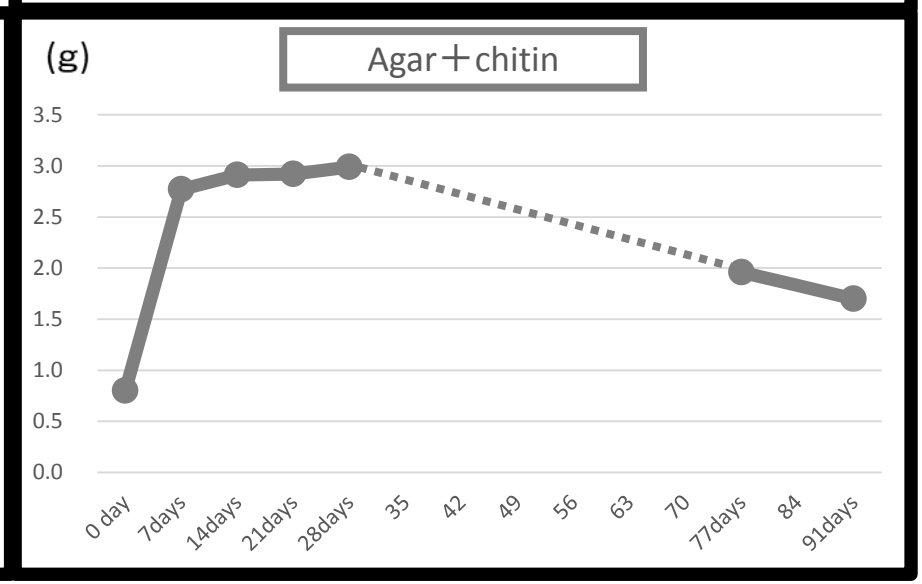
28 days later

91 days later

Mass Variation







Prospects

○ Things to improve

- Improve durability test device
- Increase the number of experiments
- Clarify the change in durability from the viewpoint of chemistry
- Continue the biodegradability test

Prospects

○ Future plans

- Change the shape of chitin tomato
- Test for water-resistance
- Change the shape of agar sheets into other patterns

References

- Development of new material by using agar, Hyogo Prefectural Kakogawa Higashi High School, Nakatsuka Tomoaki, Hara Hodaka, Harada Yuji, Bito Miki
- Making bioplastic by using agar, Kanagawa Prefectural Atsugi High School, Iwase Rinka et al.
- Particulate formation behavior of cellulose fiber by mechanical comminution , Endo Takashi, Kitagawa Ryoichi et al. polymer collected papers, Vol.56,No3
- The basic research related to Chitosan ～pigment adsorbing function～, Hokkaido Prefectural Sapporo Nishi High School Science Club, Arakawa Yasumasa, Yamada Yuma

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Thank you for listening!