

Ectomycorrhiza: Sachiyo Watanabe (15 Apr, 2016)

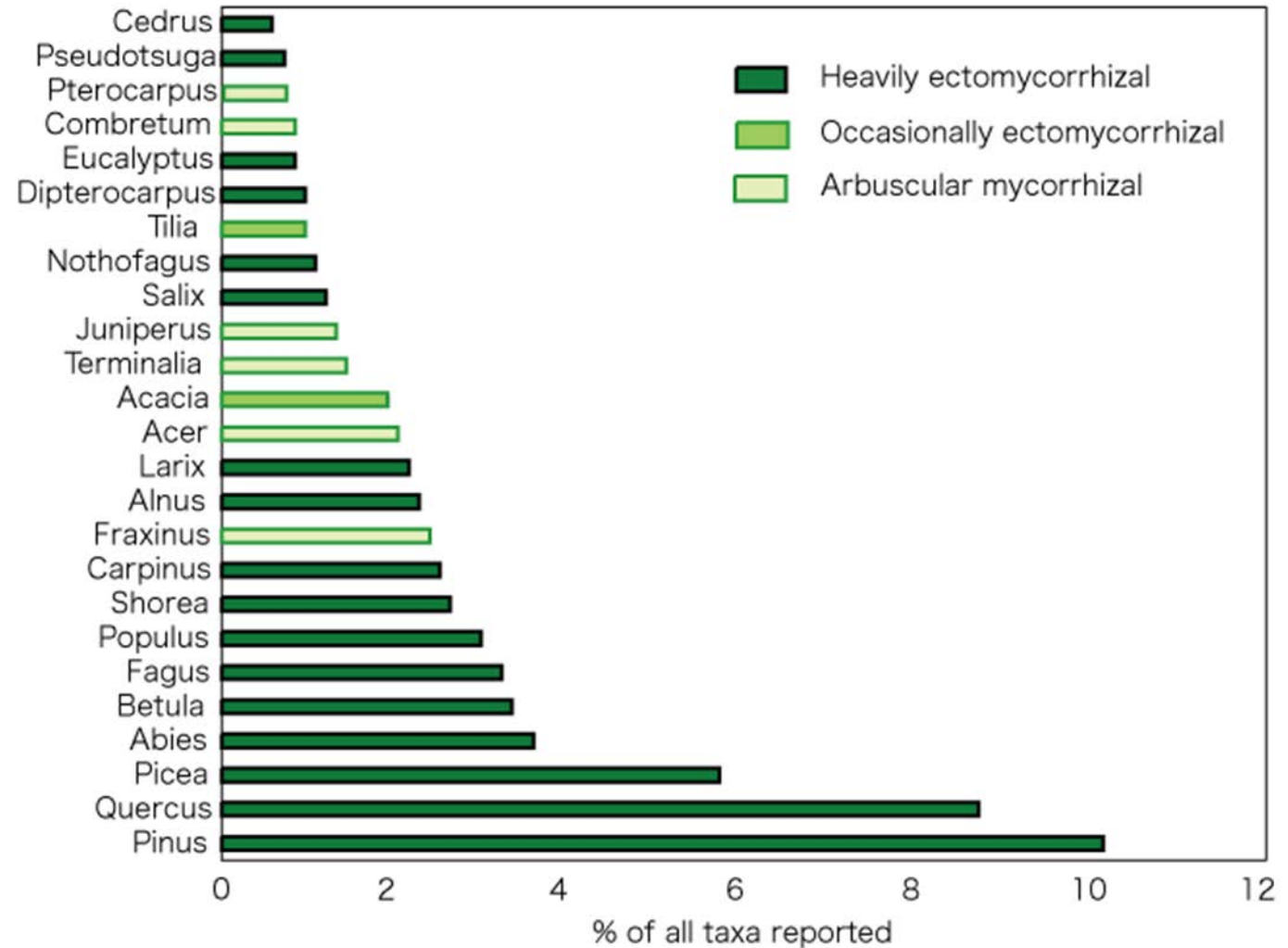
History of Mycorrhiza

- Evolution to ECM happens many times.
- ECM don't degenerate to saprobic fungi.
- VAF: 300
- ECM: 10000~?

Tree Symbiosis with Mycorrhizal Fungi

Twenty-five most common tree genera report¹
(among the ten most common species reported by 88 countries, FAO 2005)

- 3% of seed plants live in symbiosis with ECM
- 3% ...all of them are trees!
- Trees have large biomass in the Earth.
- Tree biomass is affected by ECM dynamics.



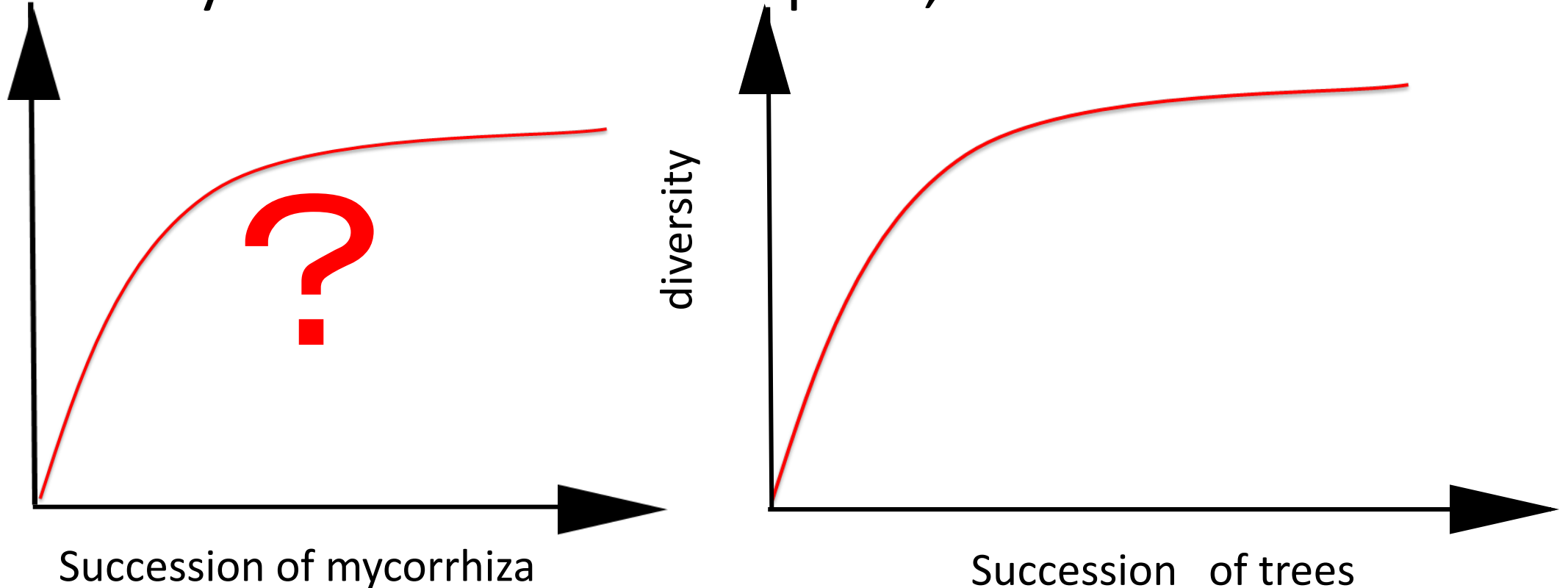
Succession of Mycorrhiza

Symbiosis types of plants and trees in bare land

1. Plants : no mycorrhiza
2. Plants : VA
3. Trees : VA,ECM
4. Trees : ECM
5. Trees : VA
 - Plants and trees : Other mycorrhiza

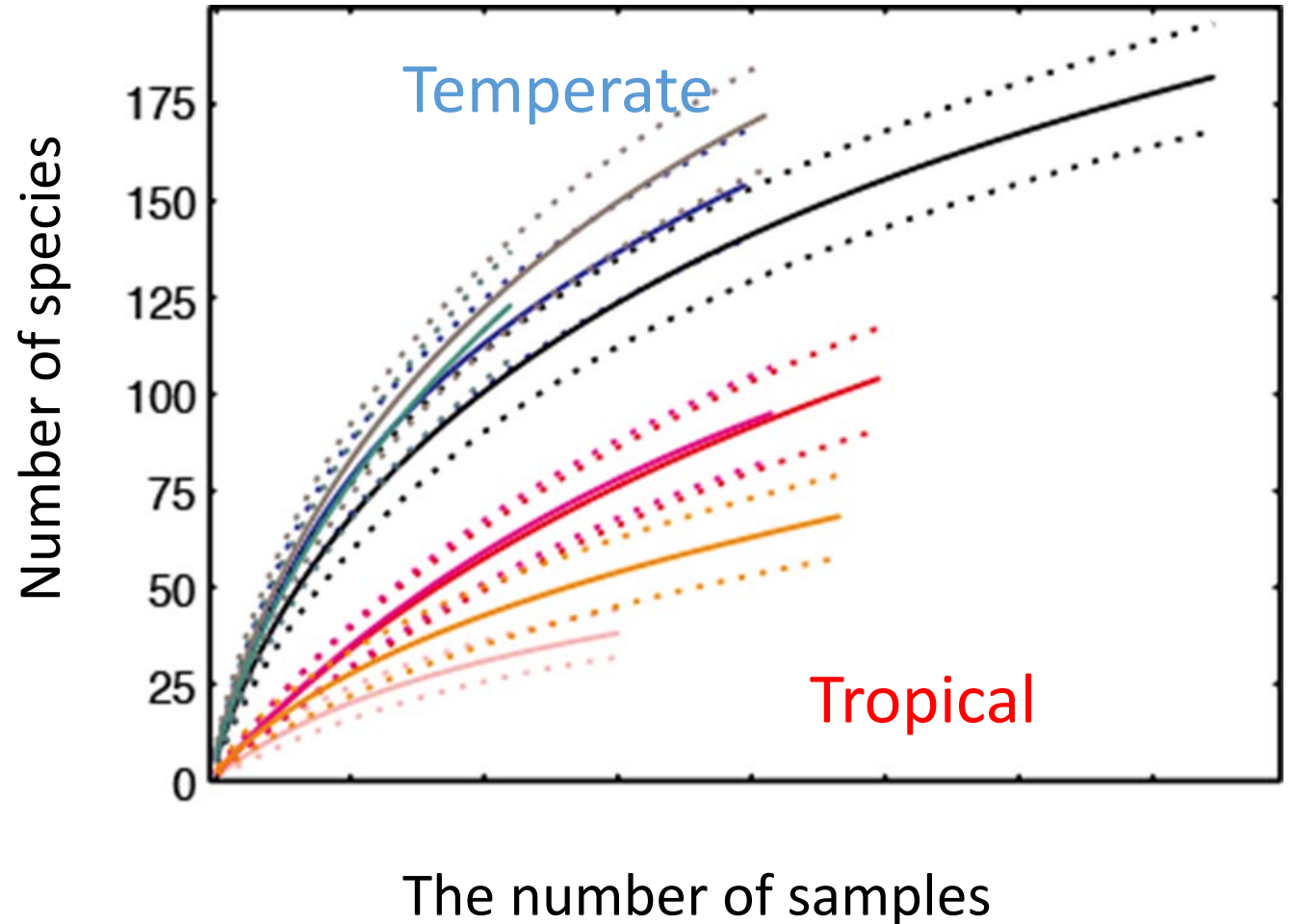
Changes of Diversity

- Diversity of vegetation reaches its peak
- Diversity of ECM reaches its peak, too

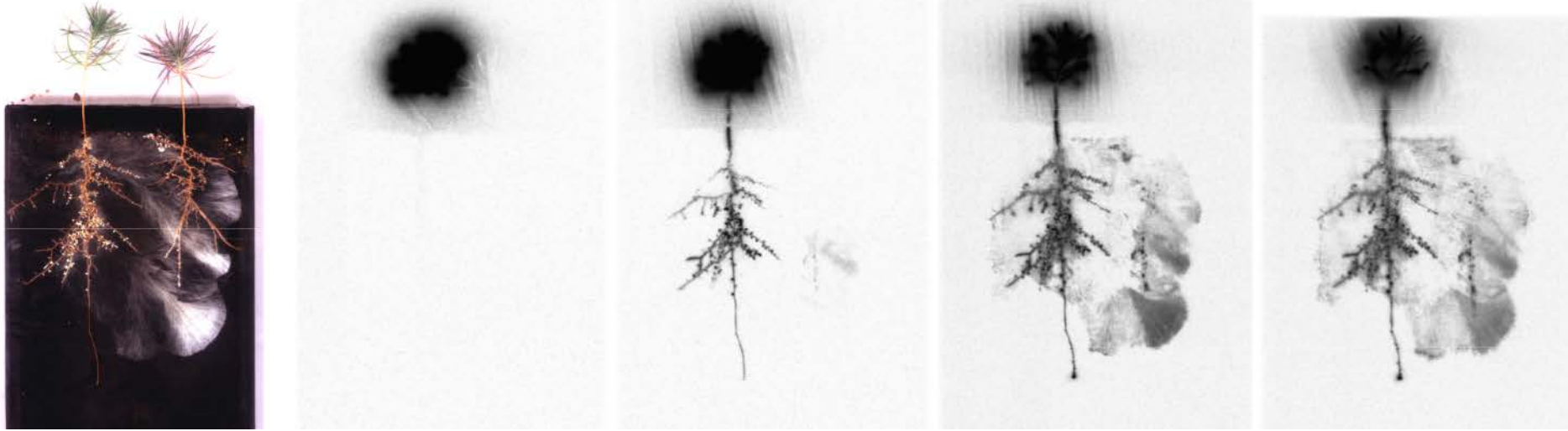


Diversity of ECM

- Diversity in Temperate forest is higher than Tropical forest
 - More species live with ECM in temperate forest than tropical forest.
 - Tropical forest has thinner soil. ECM have few space to live.
 - Tropical forest has a lot of N. Many species live with VA fungi ...



Transport of Carbon



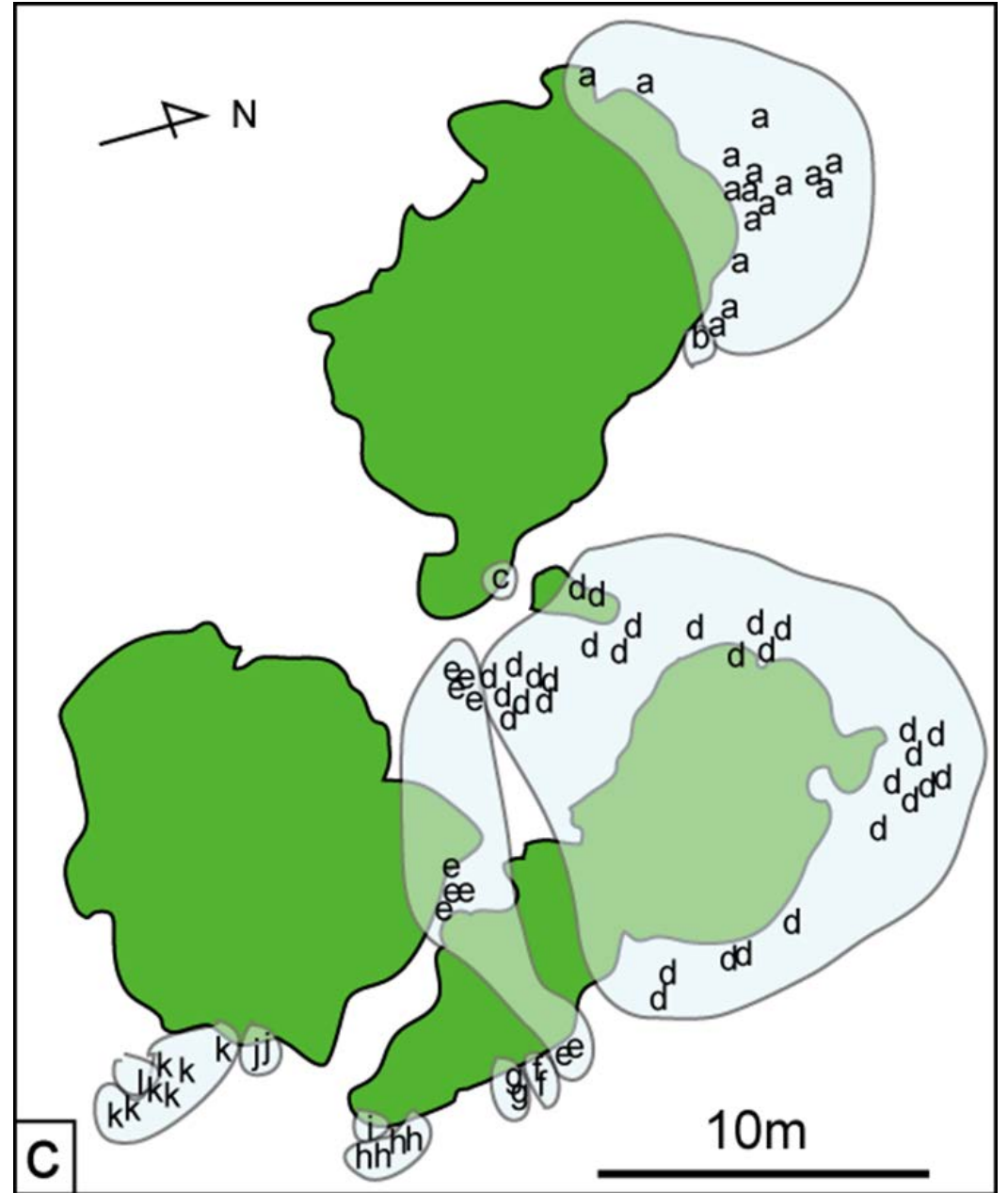
- 15~20% photosynthetic products are transported to Mycorrhiza.
- ^{14}C are transported to mycelia for one day.
 - ○ From one mycelia to other mycelia
 - △ From mycelia to plants

Transport of Phosphorus

Genet size 2

Scleroderma bovista ハマニセシヨウロ

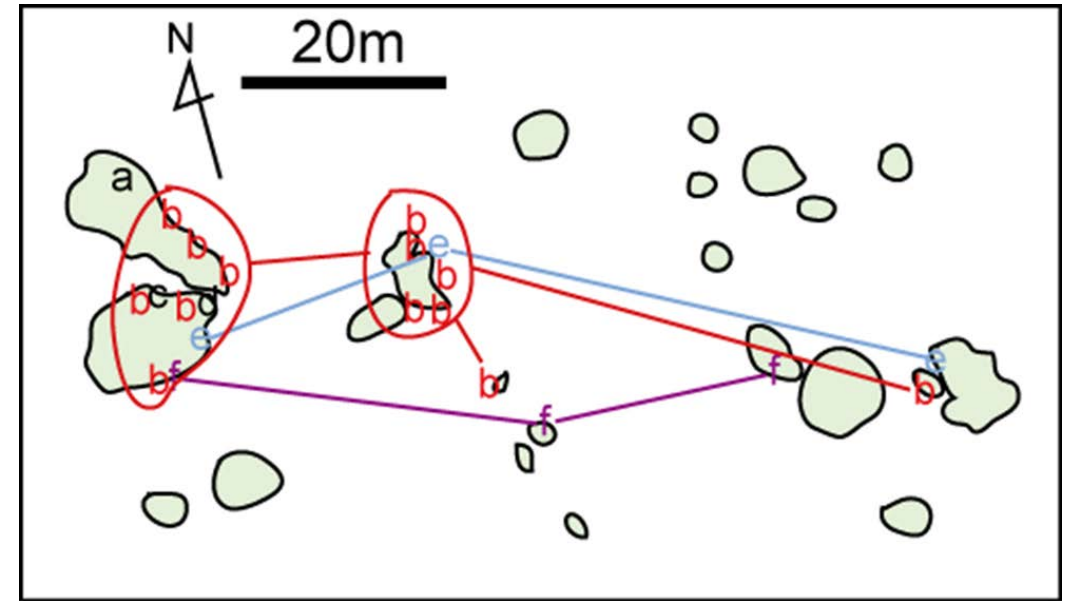
- A few ~ over 10m genet : large size
- One genet can live for several years
- Vegetative propagation



Genet size 3

Cenococcum geophilum

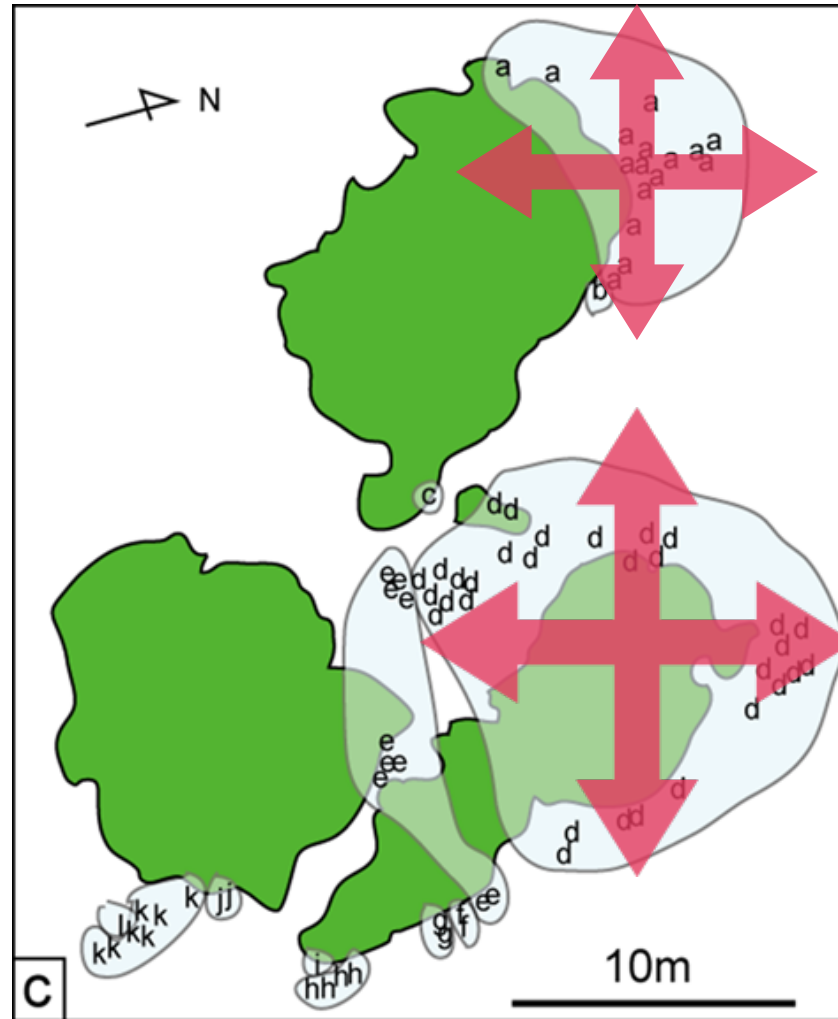
- Over 10m : very large Genet
- Slope direction
→ landslide carries spores...?



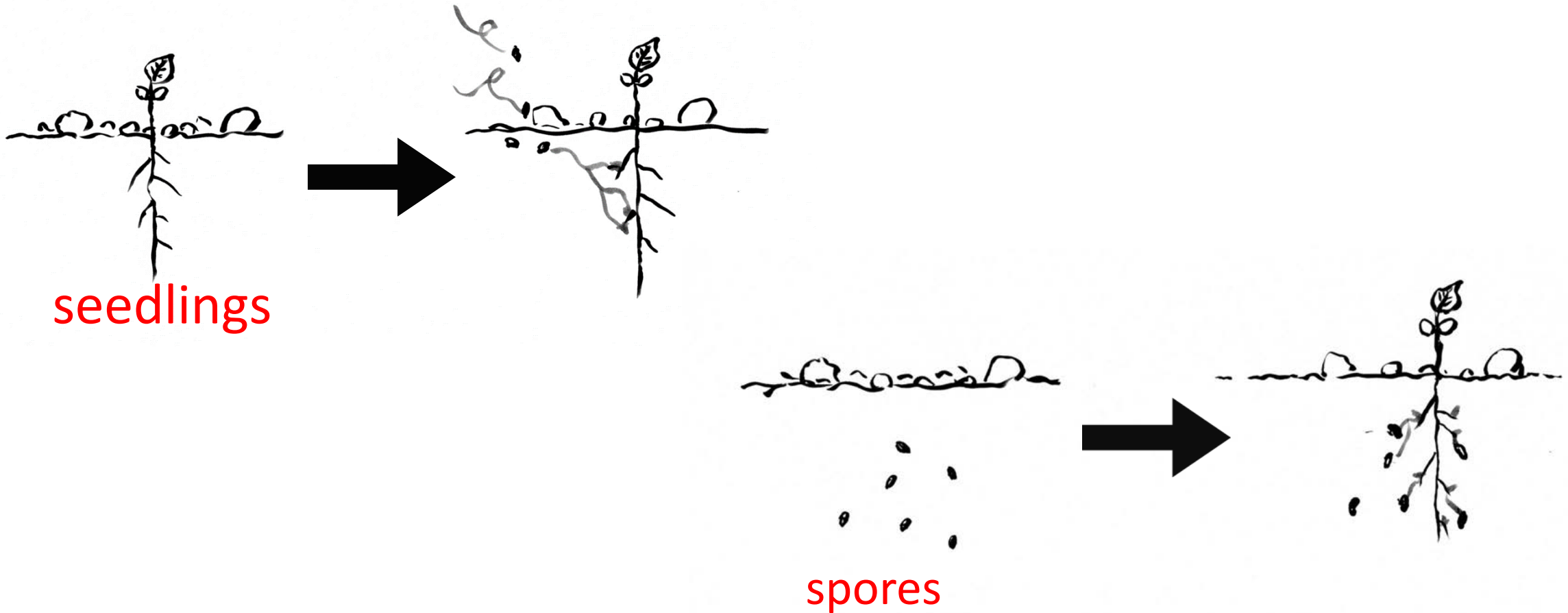
Genet size 4

- There are various genet size and generation change style.
- These characteristics control vegetation. (trees)

Expand the Range of ECM

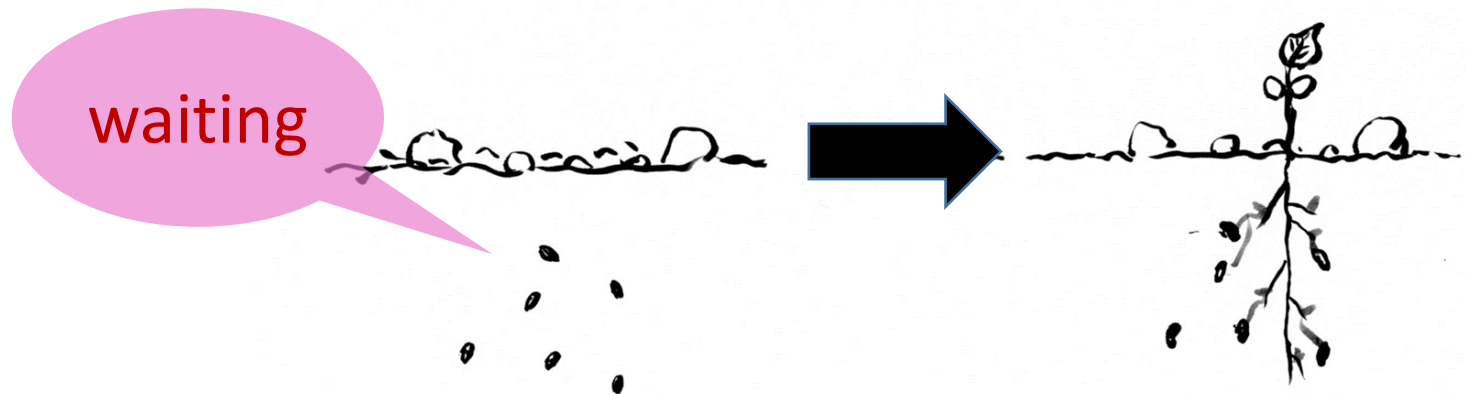
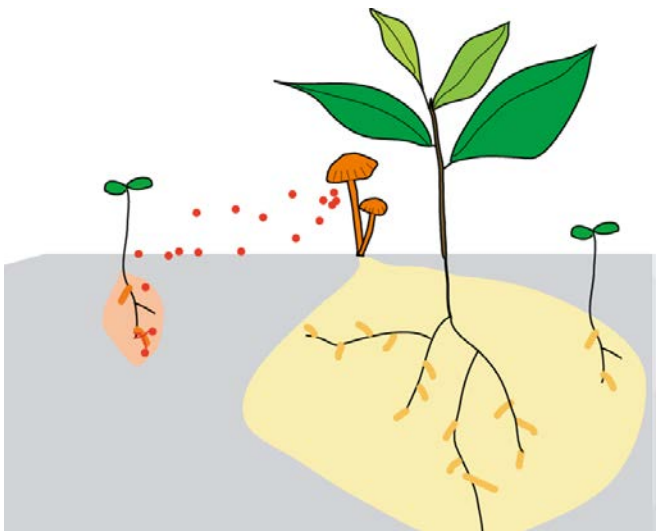


Which is the first visitor
seedlings(seeds) or fungal spores(孢子)?



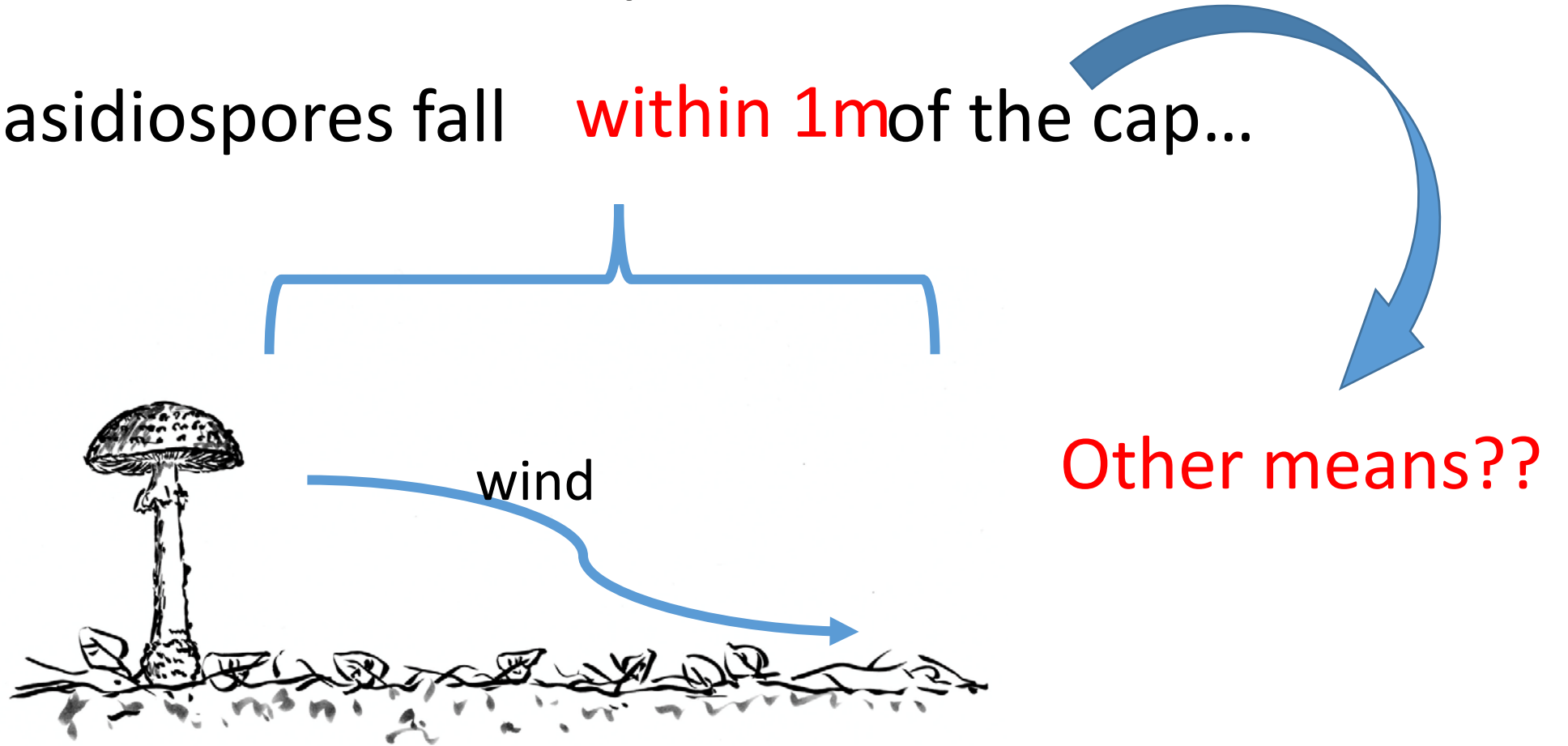
The first is Fungal spores!

1. Spores : sexual reproduction
2. Spores reach soil : **in some way**
3. Spores **wait** seedlinds(seeds) in dormant休眠 state
4. When seedling comes, spores starts symbiosis.



Dispersal 散布 of ECM spores

95% of basidiospores fall **within 1m** of the cap...



Other means to disperse

- Landslide
- Insects , soil animals
- Animal body
 - animals, insects...
- Animal droppings
 - Deer, small mammal mycophagy (Flying Squirrel **モモンガ**, Mouse...)



Soil with deer's dung

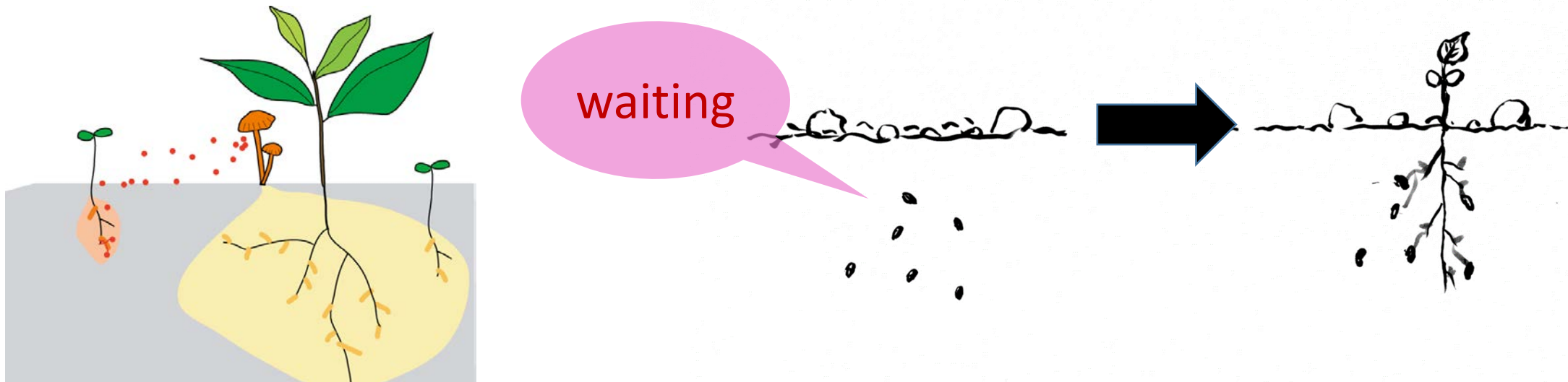
Only soil

Other means to disperse

- Many spores are appeared from small mammal mycophagy (菌食性).
- Their living range is small. But they can disperse spores of many species.

The first is Fungal spores!

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2. Spores reach soil : **in some way**
3. Spores **wait** seedlings (seeds) in dormant休眠 state
4. When seedling comes, spores starts symbiosis.



Spores life span

- How long can spores keep the activity?
- experiment
 - Rhizopogon ショウロ × 4 species
 - Pinus muricata ビショツプマツ
 - 4 years (2003~)

---Spore's life is short---?

---Spores are weak to dry---?

---They can't keep their activity fore several years---?

Spores life span

- “Year 4” spores show the highest colonization rate in this experiment
- The more time passes, the more spores colonize
- There are no long term observation

参考

- Nara , Hashimoto 2016 3 28 森林学会
- The role of ectomycorrhizal networks in seedling establishment and primary succession Nara K (2015)
- General latitudinal gradient of biodiversity is reversed in ectomycorrhizal fungi Tedersoo L, Nara K (2010)
- The role of ectomycorrhizal networks in seedling establishment and primary succession Nara K (2015)
- Major clades of Agaricales Matheny et al. (2006)
- FAO