

Research in Biotron: Mechanisms of stress response in plants



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Biotron is a facility for studying the effects of various environmental factors on plants.

It mainly consists of **built-in glasshouses** and **cabinets** (sunlight- and artificial light-types).

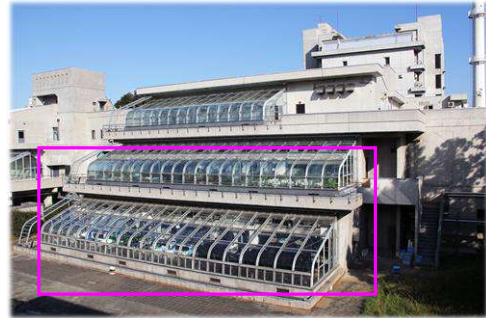


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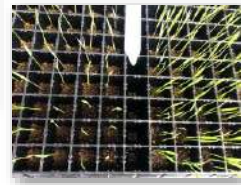
In **glasshouses**, plant materials are cultivated to use for various experiments.



From a different angle

Plant materials:

- Mangroves
- Rice
- Beech
- Morning glory
- Arabidopsis...



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Now we are cultivating **8 mangrove plant species.**

Avicennia marina

Rhizophora stylosa

Bruguiera gymnorrhiza

Kandelia obovata



Aerial root Pneumatophores
ヒルギダマシ 筍根

Prop roots
ヤエヤマヒルギ 支柱根

Knee roots
オヒルギ 膝根

Buttress roots
メヒルギ 板根

Diaspores
(Propagules)



Experiments seeking growth mechanisms and responses to growth environments.....



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In various types of **cabinets**, environmental factors, such as temperature, humidity, light intensity, and air composition, can be controlled.



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Biotron

Gas Cabinets HG series

Performance:

Temperature : 15-40°C

Humidity : 50-80%RH

Light intensity : 0-59,000lx

Wind speed : 0-0.4m/s

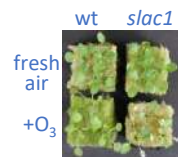
Gas treatment : O₃, CO₂, NO₂, SO₂

P1P (for transgenic plants)



Example of research:

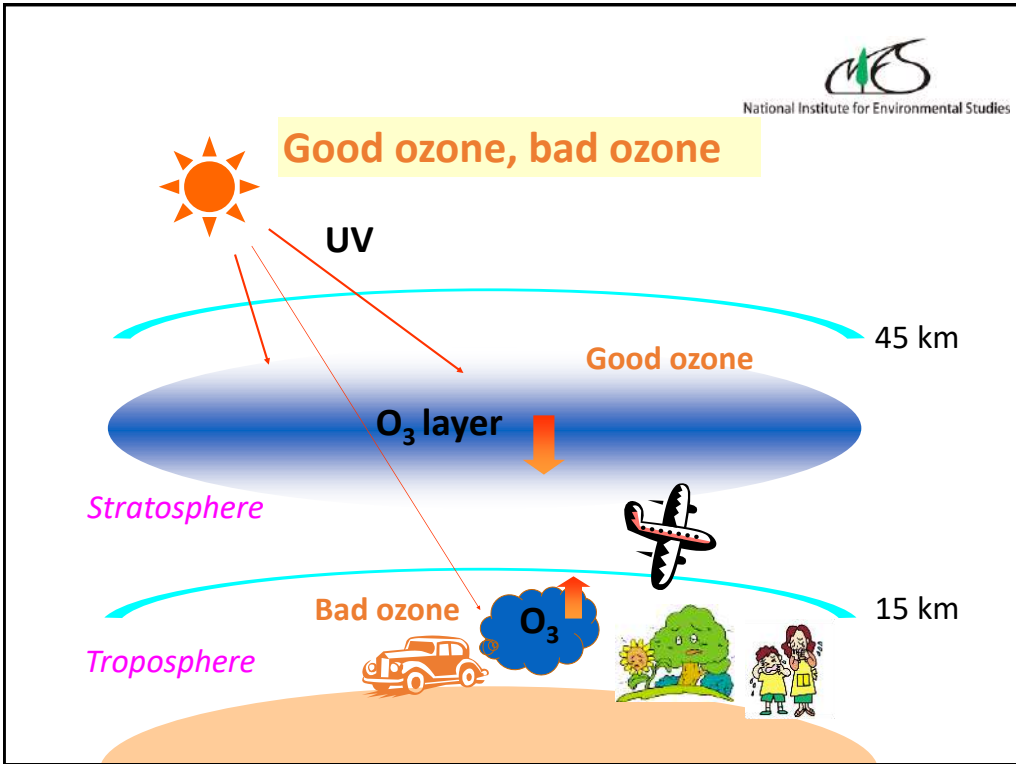
Using this facility, we have been investigating the response of plants to air pollutant, ozone.



We are currently carrying out molecular genetic studies with a model plant *Arabidopsis thaliana*. We found that an anion channel (SLAC1) is involved in the ozone sensitivity regulating the stomatal aperture¹ and photorespiration is involved in the resistance against ozone-induced cell death². We are also studying the enhancement of ozone tolerance by overexpression of a gene encoding a phytycyanin in Arabidopsis.

¹Saji S. et al. (2008) Plant Cell Physiol. 49, 2-10. ²Saji S. et al. (2017) Plant Cell Physiol. 58, 914-924.

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Example of research:

Elucidation of the combined effects of climate change and air pollution on paddy rice production and health in Asia: Ozone effect on paddy-rice production in Japan and Asia

Inside the cabinets SC · SG

⇐ In sunlight-type cabinets, rice plants are cultivated and photosynthetic parameters are measured.

● rice variety : Koshihikari (representative japonica) 2019-2021 May ~ Sept and then, Indica rice...

SC · SG cabinets In a glasshouse

2SCs: temperature and humidity regulation, supplemental lightening available

2SGs: ozone-gas exposure available

● diurnal variation of ozone concentration and temperature

SG cabinets

ozone 80 ppb

ozone 60 ppb

SC cabinets

ozone 0 ppb

ozone 0 ppb

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