

Use of Green Manure in Agriculture



Kiyoshi Tsutsuki

<http://timetraveler.html.xdomain.jp>

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Green-manure in agriculture

- Increase soil fertility
- Suppress the problems associated with continuous cropping
- Improve soil physical properties (permeability, water holding capacity)
- Increase arbuscular mycorrhizal fungi.
- Increase root nodule bacteria/ Rhizobium.
- Kill nematodes
- Absorb excess nutrients
- Absorb toxic elements

Concept of Green manure utilization

- Use of solar energy
- Conversion of CO₂ to organic carbon
- Soil improvement by plant
- Increase of soil fertility by symbiotic microbes
- Use of natural rehabilitation process in agriculture



Experiment plot for green manure

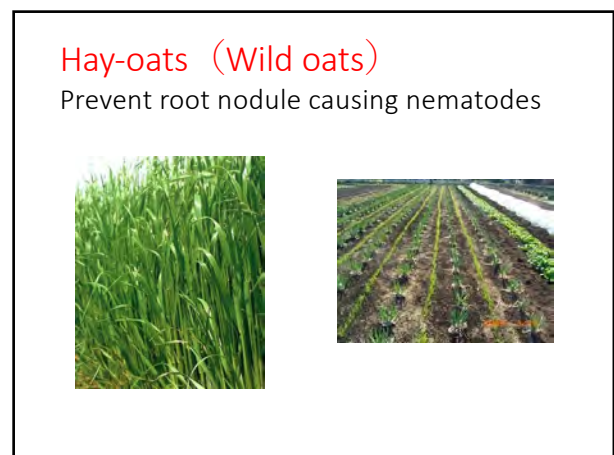
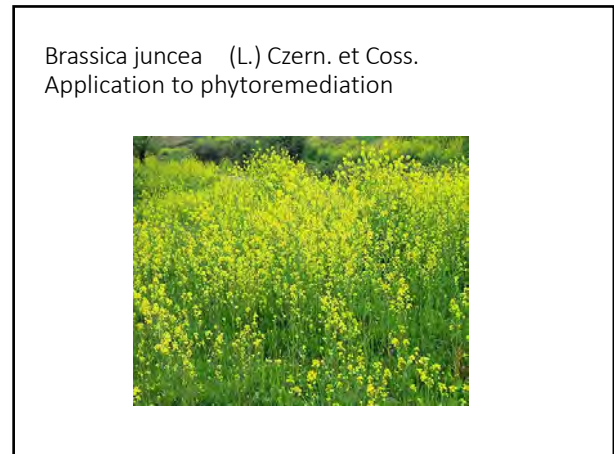


Plowing in the oats grown after harvesting wheat



August 09, 2004,
Kamiyubetsu

Onion field in Kami-Yubetsu Hokkaido
Rye will be grown after harvesting



Milk vetch

used for paddy field



Various green manures recommended in Hokkaido



Sunflower

Hairy vetch

Sinapis alba

Use of harvest residue of ear-corn for green manure



To increase forage production in Japan

Combination of green manure and crops

	Green manure	Following crops	Effects
Successive cultivation	Oats	Soy bean	Root nodules, mycorrhiza infection, nematodes suppression
	Sunflower, legume	Corn, onion	Nitrogen supply, mycorrhiza
	White mustard, legume	Sugar beet	Nitrogen supply
Fallow	Legumes	Winter wheat	Nitrogen supply

Green manure and compost comparison

- 1) Increase soil fertility
 Green manure (G) = Compost (C)
 - Nutrients in green manure will be released on decomposition.
- 2) Improve soil physical properties. G = C
 - Increase soil pore space by organic matter application.

Green manure and compost comparison 2

- 3) Increase water permeability in soil
 G > C
 Root of green manure is long and strong. It penetrates through a hard sub-layer soil. Therefore, it improves water drainage.

Green manure and compost comparison 3

- 4) Suppress the problems associated with continuous cropping. $G \geq C$
 Suppress plant pathogenic microbes
 $G \geq C$
 Suppress the activity of nematodes $G > C$
 Increase the activity of soil microbes
 $G > C$

Green manure and compost comparison 4

- 5) Increase arbuscular mycorrhizal fungi. $G > C$
 6) Increase root nodule bacteria/ Rhizobium. $G > C$

Green manure and compost comparison 5

- 8) Contribution to environmental conservation $G > C$
 a. Soil erosion is suppressed by cover crop. $G > C$
 b. Growing green manure absorbs excess nutrients in soil. Fix mineral nitrogen temporarily into decomposing organic matter. only G

Green manure and compost comparison 6

- 8) Contribution to environmental conservation $G > C$
 c. Absorb heavy metals (contribute to phytoremediation) only G
 d. Contribute to the beautiful scenery of rural area. only G
 e. Fix CO_2 in air. No emission of greenhouse effect gases. only G

Merits of green manure

- 1) Green manure can be applied uniformly to large area. $G > C$
 2) Quality of organic matter applied to the field is uniform. $G > C$
 3) Labor may be less compared with compost application. No transportation cost is necessary. $G > C$

Demerits of green manure 1

- 1) Adverse effects $G = C$
 • Stunt due to insufficient decomposition
 • Nitrogen starvation due to high C/N
 • Transfer disease and worm hazards due to improper combination of green manure and following crop
 2) Need fallow period for growing green manure
 $G < C$

Demerits of green manure 2

- 3) Effect of green manure may differ by each species of green manure,
 - Therefore, almighty effects are not expected.

Demerits of green manure 3

- 4) Combination between green manure and following crop should be considered.
- 5) Green manure sometimes increases nematodes by mixing into soil.

Demerits of green manure 4

- 6) Seeds of may be expensive, but pure and good seed is necessary.
- 7) Green manure may turn to weed or wild grass on improper management.