How to prepare and use compost for sustainable agriculture + Topics on Green Manure

Part 5: Green manure and compost

Kiyoshi Tsutsuki

Prof. Ph.D in Soil Science (tsutsuki@obihiro.ac.jp) Obihiro University of Agriculture and Veterinary Medicine

Green-manure in agriculture

Beneficial Effects of Green manure

- 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

Contrasting Concept of Compost Utilization

- Recycle organic wastes as resources
- Conversion of raw OM to stable OM
- Soil improvement by humified organic matter
- Increase of soil fertility by nutrient release from decomposing OM



Use of humification process in agriculture

Experiment plot for green manure (June 27, 2004)





Plowing in the oats grown after harvesting wheat

August 09, 2004, Onion field in Kami-Yubetsu Hickketido Rye will be grown after harvesting



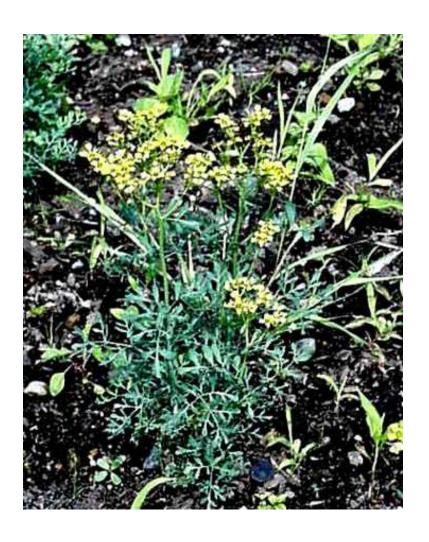


Brassica juncea (L.) Czern. et Coss. Application to phytoremediation



White mustard (Sinapis alba, Brassica alba)





Angeria

Prevent the disease of leek





Crimson Clover Prevent cyst-nematodes of soy-bean



Hay-oats (Wild oats)

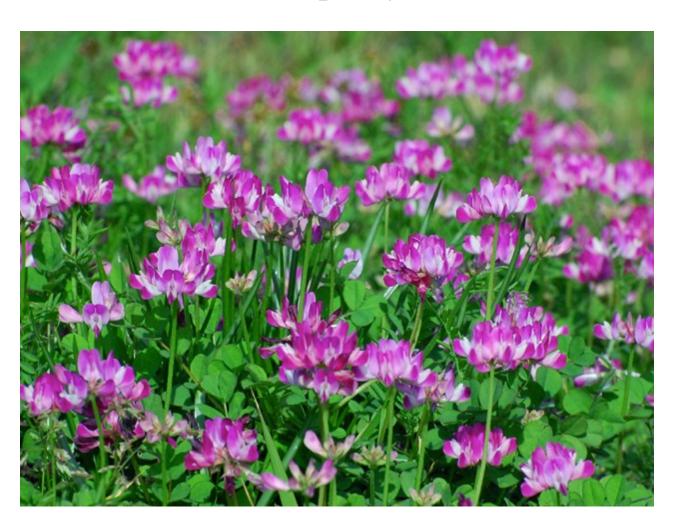
Prevent root nodule nematodes





Milk vetch

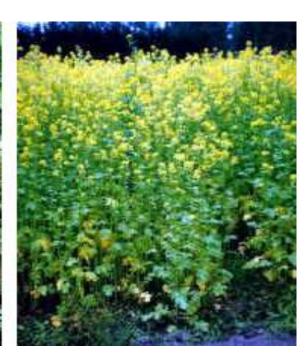
used for paddy field



Various green manures recommended in Hokkaido







Sunflower Hairy vetch Sinapis alba

Use of harvest residue of ear-corn for green manure

Now studying

To increase forage production in Japan

- 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.

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.

4) Suppress the problems associated with continuous cropping. G >= C

Suppress plant pathogenic microbes

$$G >= C$$

Suppress the activity of nematodes > C

Increase the activity of soil microbes

$$G = C$$

5) Increase arbuscular mycorrhizal fungi. G > C

6) Increase root nodule bacteria/ Rhizobium. G > C

- 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

- 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 CO2 in air. No emission of harmful gasses. only G

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- 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

1) Adverse effects

- $\mathbf{G} = \mathbf{C}$
- Stunt due to insufficient decomposition
- Nitrogen starvation due to high C/N
- Transfer decease and worm hazards due to improper combination of green manure and following crop
- 2)Need fallow period for growing green manure G < C

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

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

- 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.