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Application of recycling fertilizers

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Application of recycling fertilizers

>Application techniques

>Risks in relation with compost / digestate application

>Choosing a compost/digestate and the application strategy

>Example: Compost for vegetable crops

Correct use of compost (and digestate): Swiss quality guidelines 2010

Conclusions







Compost and solid digestate in open field: a spreader with plates is recommended





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>Liquid digestate: application with a digger is recommended; application in the evening or early in the morning is advantageous

Rapid incorporation of the compost / digestate in the upper 10 cm of soil

>Equipment with large tyres

>Attention to the conditions of soil should be paid







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>Plastics, glass, iron

Selection and sorting of input materials

>Organic pollutants, heavy metals, antibiotics, pesticides

- Selection of input materials
- >Weeds, pathogens
- > Process management

>Nitrogen immobilization

> Type and maturity stage of the compost



>Nitrogen immobilization: evaluation of risks



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- >Target use / desired effects
- > Short term fertilization effect
- > Improvement of soil structure (porosity, water holding capacity, reduction of erosion, ...)
- > Effect on soil pH
- Suppression of plant diseases
- Component of culture substrates
- > Field culture / vegetables / trees / culture in pots / ...



>Parameters to consider when choosing the product depending on the target use / desired effects

> Nutriment contents (macro and trace nutriments)

Nutriment [kg/m ³]		Liquid digestate	Solid digestate	Compost	
Total nitrogen	N _{tot}	4 (2-8)	3.5 (2.3-4.1)	4 (2.6-6.5)	
Soluble nitrogen	N _{min}	2 (0.75-5)	0.7 (0.2-0.7)	0.1 (0-0.4)	
Phosphorus	P_2O_5	1.5 (0.95-3)	0.35 (0.2-0.4)	1.7 (1.1-2.9)	
Potassium	K ₂ O	4.1 (2-8.3)	2.8 (1.9-3.5)	3.6 (2-6.2)	
Magnesium	Mg	0.9 (0.6-1.6)	1.5 (1-1.9)	2.1 (1.4-3.9)	
Calcium	Са	5.4 (2.7-7.8)	25.5 (10-37)	22.8 (11-25)	
Sulfure	S	0.3 (0.1-0.5)	0.4 (0.2-0.5)	0.5 (0.3-0.7)	
Organic matter	MO	50 (44-56)	133 (106-210)	133 (86-224)	
Source: Swiss Directive 2010 on the quality of copost and digestate					



>Parameters to consider when choosing the product depending on the target use / desired effects

- > Nutriment contents (macro and trace nutriments)
- > Availability of nutrients (nitrogen)
- > pH, salinity



Damages caused by too high salinity





Damages caused by too high pH





>Parameters to consider when choosing the product depending on the target use / desired effects

- > Nutriment contents (macro and trace nutriments)
- > Availability of nutrients (nitrogen)
- > pH, salinity
- > Stability of the organic matter
- > Biological activity (potential of disease suppression)
- > Evaluation of input materials (contamination with plastics, glass, ...)



>Ways to influence product characteristics

- > Selection of input materials
- > Treatment system (for example composting / anaerobic fermentation)
- > Process management (post-treatment and storage included)
- > Maturity stage



- >Choice of application strategy
- Application timing
- Total application quantity
- > Quantity of product used at each application
- > Application technique (broad, concentrated, ...)
- > Combination of products



Correct application strategy

- > Adapted to the target culture
 - > Broad application
 - > Application under the rows or in the mounds
 - > Sensitivity of the crop to salt or high pH (horticulture)
 - > Phytosanitary risks (e.g. powdery scab of potatoes)
- > Adapted to the season
- > Adapted to the target effects
 - > Improvement of soil structure on the middle / long term
 - > Short-term fertilization



Example: Compost for vegetable crops





Example: Compost for vegetable crops

>Annual application of compost, adapted to fertilizers' balance

>Application of liquid digestate in spring to boost the crop

>Application of mature compost (to avoid nitrogen immobilization) to improve the plant health and the soil structure

>Depending of the crop, broad or concentrated application on the row or in the plantation hole (mixed with soil)

>Application at sowing or at planting

>Incorporation of the compost in the upper 5-10 cm of soil





Swiss guideline 2010

Available in french and german on <u>www.biophyt.ch</u>

>Minimum quality requirements: Swiss Legislation

- > FAC guidelines 1995
- > Heavy metals, impurities, hygienisation: ORRChim
- > Objective: no negative impact on the environment

Swiss compost and digestate guidelines 2010

- > Voluntary standard of the compost trade
- Objective: To avoid problems in relation to utilization of digestate and compost
- Support for choosing the appropriate product, depending on the utilization



>Five products classes

- > Digestate liquid for agricultural use
- > Digestate solid for agricultural use
- Compost for agricultural use
- > Compost for field horticulture
- Compost for covered cultures



Criteria	Composts and digestates for agricultura I use			Compost for horticultural use	
	Digestate liquid	Digestate solid	Compost	Compost for field horticulture	Compost for covered cultures
DM (dry matter) [% FM]	Х	х	Х	> 50 %	> 55 %
OM (organic matter) [% DM]	Х	х	Х	< 50 %	< 40 %
рН	Х	Х	Х	<u>< 7.8</u>	<u>< 7.5</u>
Particle size [mm]		Х	Х	< 25	< 15
Coulor of extract		(X)	< 1.0	<u>< 0.5</u>	<u>< 0.2</u>
Salinity [g KCleq/kg DM]	Х	х	Х	<u>< 20</u>	<u>< 10</u>

Minimal requirements, recommendation, X: has to be mentioned; (X): mention recommended



Criteria	Composts and digestates for agricultural use			Compost for horticultural use	
	Digestate liquid	Digestate solid	Compost	Compost for field horticulture	Compost for covered cultures
Total nitrogen [g/kg DM]	х	х	х	> 10	> 12
Ammonium (N-NH₄) [mg/kg DM]	> 3'000	<u>> 600</u>	<u>< 600</u>	<u>< 200</u>	<u>< 40</u>
Nitrate (N-NO ₃)[mg/kg DM]			Х	<u>> 80</u>	<u>> 160</u>
Nitrite (N-NO ₂)[mg/kg DM]			(X)	< 20 mg/kg DW	< 10 mg/kg DW
Nmin. [mg/kg DM]	> 3'000	> 600	> 60	> 100	> 160
N-NO ₃ /Nmin.			(X)	> 0.4	> 0.8

Minimal requirements recommendation X: has to be mentioned; (X): mention recommended



Criteria	Composts and digestates for agricultural use			Compost for horticultural use	
	Digestate liquid	Digestate solid	Compost	Compost for field horticulture	Compost for covered cultures
Biotest cress open				<u>> 50% from</u> <u>control</u>	<u>> 75% from</u> <u>control</u>
Biotest cress closed			(X)	<u>> 25% from</u> <u>control</u>	> 50% from <u>control</u>
Biotest lettuce				> 50% from control	<u>> 70% from</u> <u>control</u>

Minimal requirements, recommendation, X: has to be mentioned; (X): mention recommended



Training programme

- > Basic module
 - > general overview of biowaste management
 - > grounding in the legal basics
 - > biological basics of composting
 - > aspects of management of a composting plant





Training programme

- > Quality module
 - > process and quality control
 - simple chemical and plant tests
 - > analysis and interpretation of results
 - > installation from a simple laboratory on the plant to assure quality





>Quality management: from collecting the biowaste to compost use

- > Quality of the green waste
- > Composition of the starting mixture
- Management of composting process
- > Compost storage
- > Choice of the adequate compost for each utilization
- Compost application strategy



Conclusions





Conclusions

>Positive effects of composts et digestats

- > On the chemical characteristics of the soil
- > On the physical characteristics of the soil
- > On the (micro) biological characteristics of the soil
- > Phytosanitary effects

>Getting a positive effect from compost/digestate is only possible with good quality products and a correct application





Publication on biology, production quality and use of composts (and digestates)

To be downloaded for free on <u>www.biophyt.ch</u>



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Questions ? Discussion ?



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