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Mission

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Industrial Solutions

for the

treatment of organic matter

using Insects

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Research Center

Which Substrates can be used?

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VEGETABLE VALORIZATION

- Vegetable waste
- Starchy fruits (vegetables, citrus fruits, etc.)
- Beer bagasse
- Fruits and vegetables processing waste (pulp, seeds, etc.)
- Whey and other dairy products
- Egg and Derivatives
- Waste products from the production of bioethanol, such as wheat protein and barley
- Oil press cake and fat seeds
- Fermentation byproducts

MIX REMOVAL

- Pig manure
- Chicken manure (especially good)
- Meat industry waste
- Sludges from WWTP
- Restaurant organic residues
- Expired / unscheduled food from supermarkets

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VALORISATION ROUTES

- VR1 BLOOD HYDROLYSATE
- VR2 INSECT FRASS
- VR3 N-STRUVITE
- VR4 K-STRUVITE

GROUPS OF ADVANCED SOIL IMPROVERS

SUPPLEMENTED SINGLE BIOWASTE FEEDSTOCKS

BLOOD HYDROLYSATE FRASS COATED STRUVITE GRANULES

BLENDS OF BLOOD HYDROLYSATE STRUVITE FRASS WITH MINERAL FERTILISERS

VALIDATION OF FORMULATIONS

AT LEAST TEN FORMULATIONS

- LABORATORY
- MICROCOSM
- GREENHOUSE
- FIELD PILOTS

AT LEAST FIVE FORMULATIONS

LIVING LABS PILOT VALIDATION WITH END USERS

MINIMUM 5 MARKET-READY BIOWASTE SOIL IMPROVERS

SOILUTIONS VR2 (following key findings from VALUEWASTE) aims to optimize pilot-scale frass production (50 kg/h) to obtain a product with a well-known composition. Key soil beneficial components (chitin, organic matter, growth promoting organisms, NPK) will be concentrated and potential contaminants or non-beneficial components will be separated from frass. A final pelletization process will facilitate logistics and application in soils. Addition to frass of Microbial Plant Biostimulants (MPB) and/or Non- Microbial Plant Biostimulants (NMPB) will be considered to increase frass cation exchange capacity, increase microbial activity to enhance biodiversity and prevent erosion. Frass coatings with N/K-struvite (VR3, VR4) and/or blood hydrolysate (VR1) will also be considered.

Composition of the insect building blocks RUSTICA project results

Sample code	TOC	TN	TOC/TN	OM	$N\text{-}NO_3^-$	$N\text{-}NH_4^+$	P total	K total	Mg total	Ca total	Fe total
	(% ADM)			(% ADM)	(µg/g ADM)		(g/kg ADM)				
Tomato plants	28,1	1,8	16,1	55,0	20	46	12	62	11	65	3,89
Bear bagasse	47,7	1,8	27,2	92,1	4	24	8	2	2	7	< 1.100
Olive pulp 80%+bagasse20%	48,5	1,5	32,3	90,4	41	38	2	27	2	6	< 1.100
Broccoli plant	30,9	2,6	11,7	50,3	26	49	12	58	12	72	5,218
Vegetables mix	33,1	2,2	15,1	43,7	977	101	5	41	13	48	11,311
cereal	44,8	5,1	8,8	87,8	13	38	7	24	4	12	< 1.100
Larvae Biomass1	58,5	7,1	8,3	94,9	48	0	6	9	2	9	< 1.100
Larvae Biomass2	50,3	7,2	7,0	95,5	13	8	4	7	2	5	< 1.100
Larvae Biomass3	50,9	7,1	7,2	95,7	14	9	4	7	2	4	< 1.100

Composition of the biomass produced from *Hermetia illucens*

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	Colony substrate 1	Colony substrate 2	Bagasse substrate 1	Vegetable substrate 1	Vegetable substrate 2	Vegetable substrate 3	Vegetable substrate 4
Dry matter (%) (105ºC)	83.60	82.8	80.9	90.1	89.5	32.6	35.5
pH (extract 1:5)	7.1	7.1	9.91	6.56	7.82	9.34	9.10
Conductivity (ms/cm) (25ºC)	620	-	11.72	11.07	11.065	16.002	15.912
Organic Matters (%) (550ºC)	72.80	82.8	81.5	82.8	91.9	23.8	74
Ashes (%)	27.2	17.2	18.47	6.94	7.70	9.97	31.05
Ratio C/N	10.9	11.7	16	17.5	18.4	20.7	20.5
Total Nitrogen (N) (%)	4.01	4.09	2.95	2.75	3.05	0.67	2.97
Phosphorous (P) (%)	1.53	3.47	3.5	0.4	0.47	0.23	0.65
Potassium (K) (%)	2.40	2.84	8.08	1.22	1.42	2.29	7.76

**values shown by dry weight*

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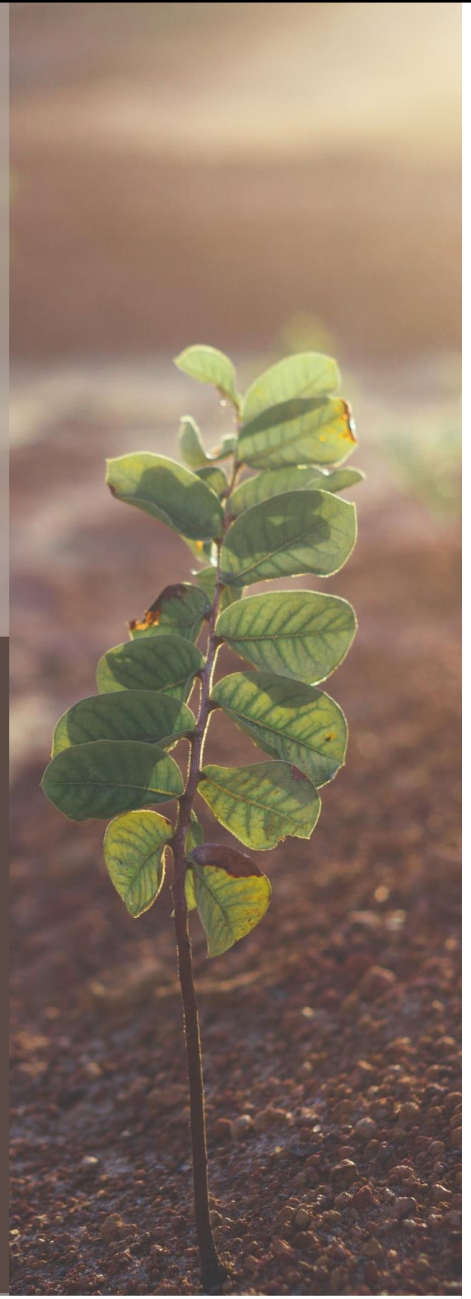
RUSTICA Demonstration of circular biofertilisers and implementation of optimized fertiliser strategies and value chains in rural communities

Lesson learned from VALUEWASTE and RUSTICA projects

- Larva grows very well on urban waste, especially at a proportion Organic fraction/digestate of 80/20
- Insect frass proceeding from urban waste is low in pathogens but heavy metals could be present.
- The most productive and flexible insect species for frass production is Black Soldier Fly (BSF)
- Composition of BSF frass is very heterogeneous and need stable input to have stable output. But Insect biomass is very stable.
- Frass is still fermentable and thus needs either further composting or to apply in advance before planting
- Plant growth enhanced in seedlings but become a bit phytotoxic with doses higher than 3 %
- OM is highly degradable, and all the carbon source is degraded in a year.
- The conversion process with insects is profitable if feedstock is cheap or insect products are commercialised.

FRASS

An organic plant fertiliser made from black soldier fly.



Frass is an alternative to the use of conventional fertilisers. Its additional advantage is its chitin content, which gives it biostimulant and plant health-promoting properties.

It is a product that can be used on a wide variety of crops, due to its low humidity and its presentation in powder form.

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Product description

Insect fertiliser obtained exclusively from Black Soldier Fly droppings. In addition to a balanced NPK, it contains chitin, a natural biostimulant.

Parámetro	Valor	Unidad
Ash	4,12	%(p/p)
Organic Matter	95,9	%(p/p)
Total organic carbon	53,7	%(p/p)
Total carbon to total nitrogen ratio	13,5	%(p/p)
Total nitrogen	3,97	%(p/p)
Amonniacal Nitrogen	0,557	%(p/p)
Nitric Nitrogen	97	mg/kg
Ureic Nitrogen	<0,100	%(p/p)
Organic Nitrogen	3,40	%(p/p)
Total Phosphorus	1,65	%(p/p)
Total Potassium	0,2266	%(p/p)
Total Calcium	0,443	%(p/p)
Total Magnesium	0,440	%(p/p)
Total Sodium	0,02933	%(p/p)
Total Borom	4,8	mg/kg
Total Copper	16,4	mg/kg
Total Iron	0,0835	%(p/p)
Total Manganese	45,8	mg/kg
Total Zinc	0,0175	%(p/p)

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