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Auswahl, Haltung und Zucht Geeigneter Insekten

BfR-Symposium: Insekten als Lebens- und Futtermittel – Nahrung der Zukunft?

Berlin, 24. Mai 2016

Frank Pudel

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Why we need new protein sources?

Global growth in population - 9 billion people in 2050 – and increased welfare levels lead to fast increasing demand for high quality foods

72% increase in global meat demand (2000 vs 2030)

50% in aquaculture (2010 vs 2030)

60 MT proteins forecasted to be missing by 2030 in order to meet the expected demand (FAO)

In order to produce 1 kg of meat 6–10 kg plant protein is needed, which lead to a growing demand on agricultural acreage.

Livestock breeding generates 12% of global greenhouse gas emissions.

Source: IPIFF, 2016

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Fish meal price trend

Increase of demand leads to protein meal constant price rising, in particular fish meal.

Fishmeal Monthly Price - Euro per Metric Ton

Description: Fishmeal, Peru Fish meal/pellets 65% protein, CIF, Euro per Metric Ton

Unit: Euro per Metric Ton

Source: IPIFF, 2016

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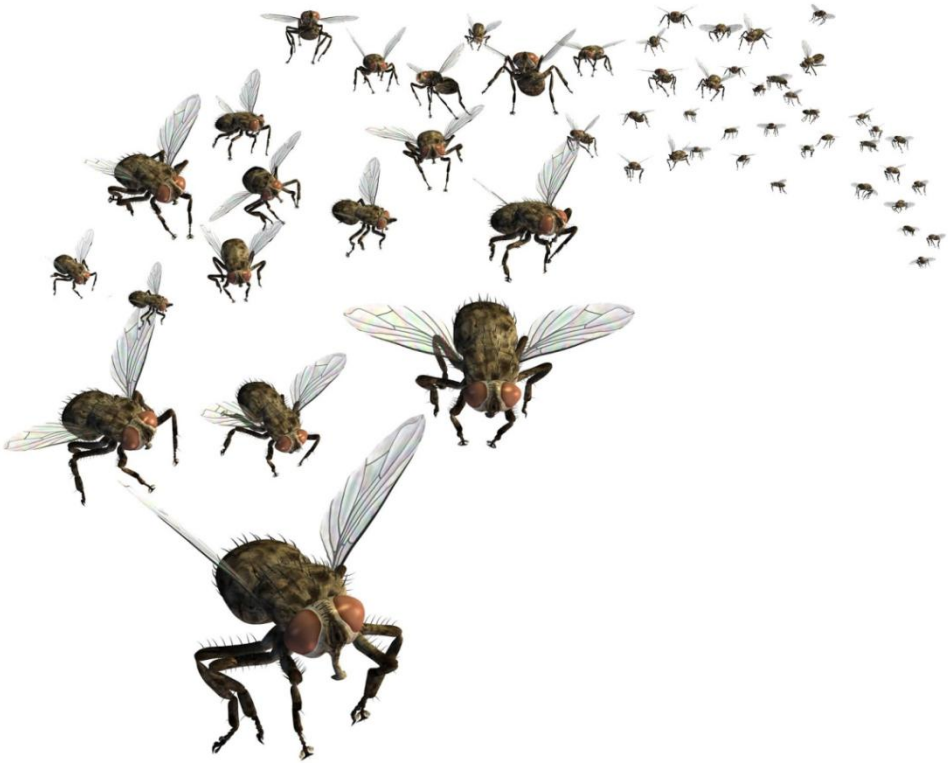
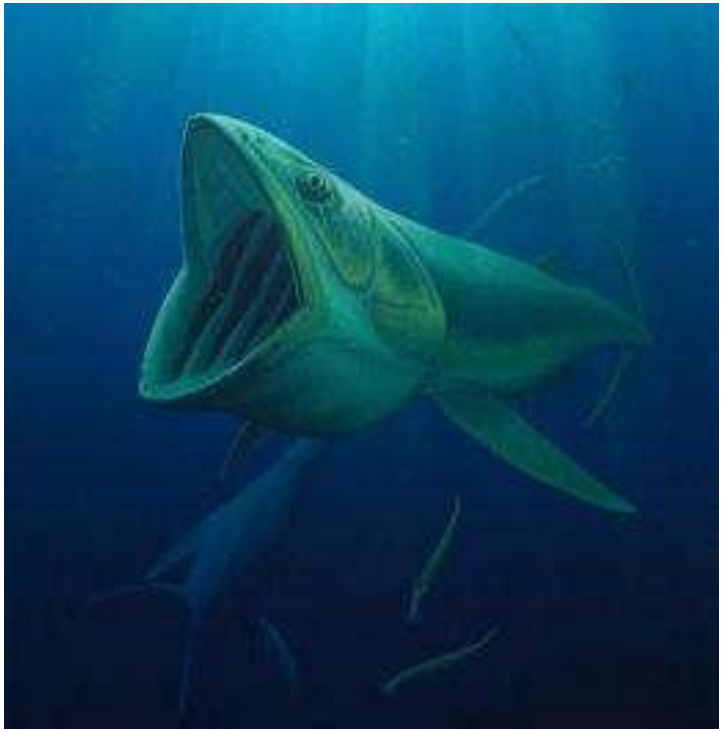
Alternative protein sources



Insects

Aquatic biomass



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Challenge

From
“hobby” style

to industrial
scale & process
control

ipiff

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Entoplant - Mehlwurmzucht

Source: www.20min.ch/2010

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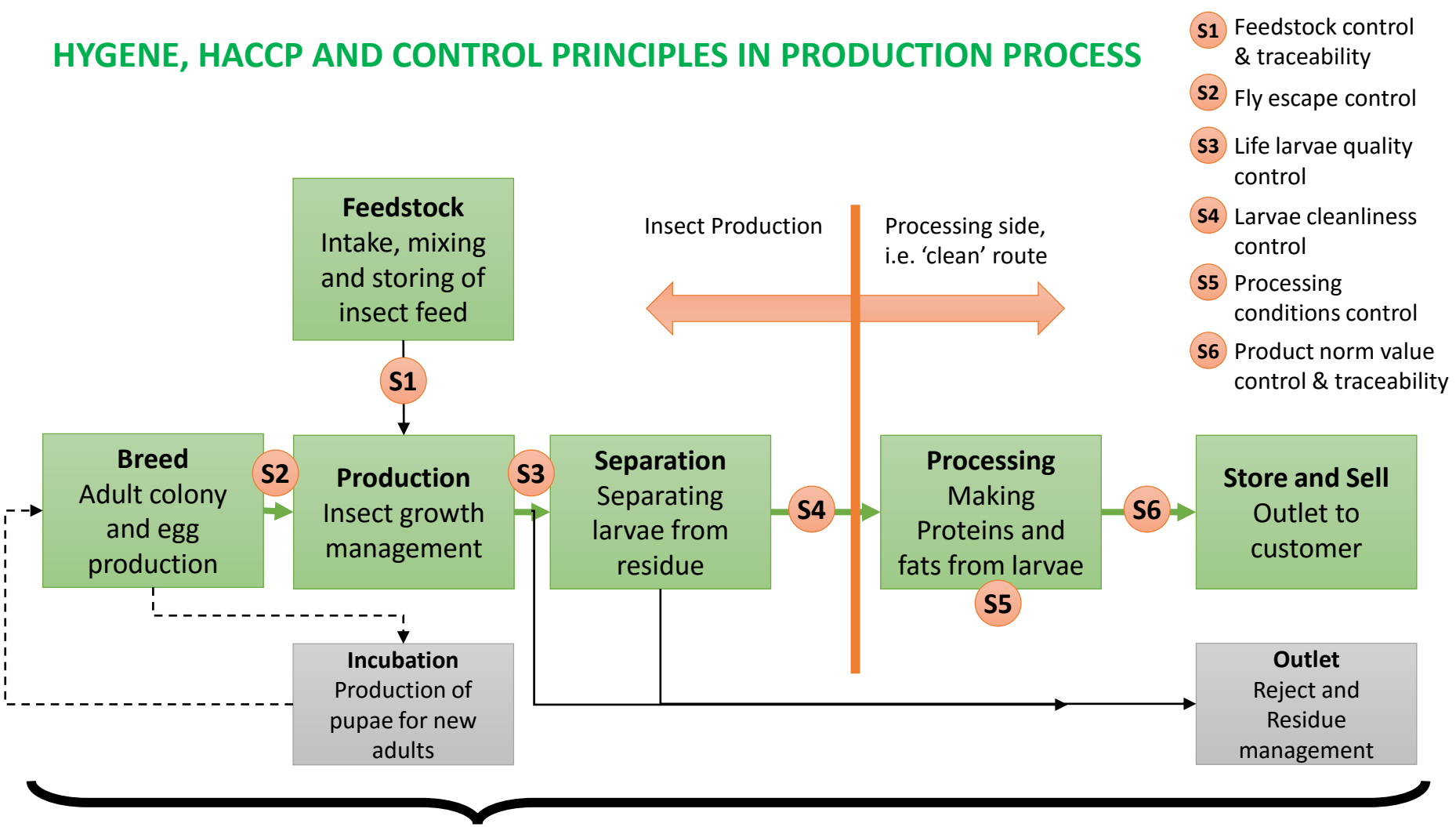
Katharina Unger: Farm 432

Source: www.kunger.at

HYGENE, HACCP AND CONTROL PRINCIPLES IN PRODUCTION PROCESS



Tracking & Tracing principles apply to whole process and sub-processes.

Source: IPIFF, 2016

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Potential of insects

Insects are the most frequently animals with regard to biodiversity and biomass.

Insects have high contents of proteins and fats and are enriched with vitamins, minerals and micronutrients.

Insects are an important part of the natural diet of widely consumed animals (e.g. trouts, poultry).

1.400 varieties are considered to be eatable.

Insects are part of the staple diet of around 2,5 billion people in large areas of the world.

Insects convert feed sources faster into meat than farm animals.

Insects often use trashy feed sources.

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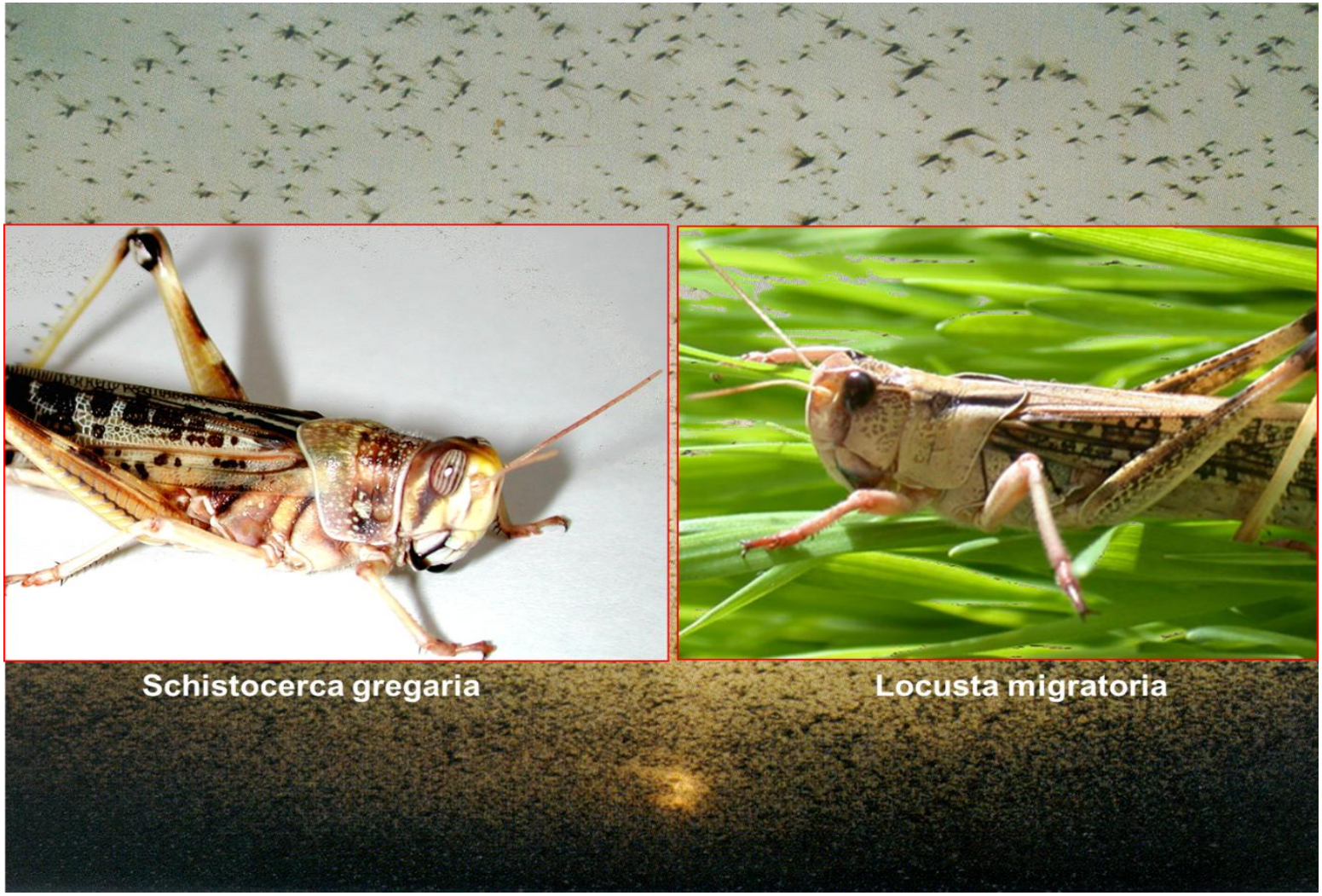
Grasshoppers (Locusts)



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Locusts

Locusts are high quality feeding material and are much valued as food in Asian and African countries

Schistocerca gregaria: North Africa, Middle East

Locusta migratoria: South Africa, from South Europe to China, Australia

Short life cycle

One Locust female produces 150 – 200 eggs within a few week

A few companies dealing with breeding of locusts as living feed for reptiles

Breeding is difficult and connected with high risks, particularly due to the high population density causing cannibalism

In a running project a new industrial production system is under development allowing a daily breeding capacity of 1 t grasshopper biomass or more. From that a protein rich material for feed or food purposes has to be produced.

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Industrial breeding of locusts

Targets:

high population density (20.000 animals/m^3)

low cannibalism rate (5%)

optimal „slaughter“ date (20 days)

Measures:

interior of breeding containers (possibilities to hide away; running surface)

optimal temperature and lighting

optimal humidity

high quality feeding material

automatic handling

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Locust breeding

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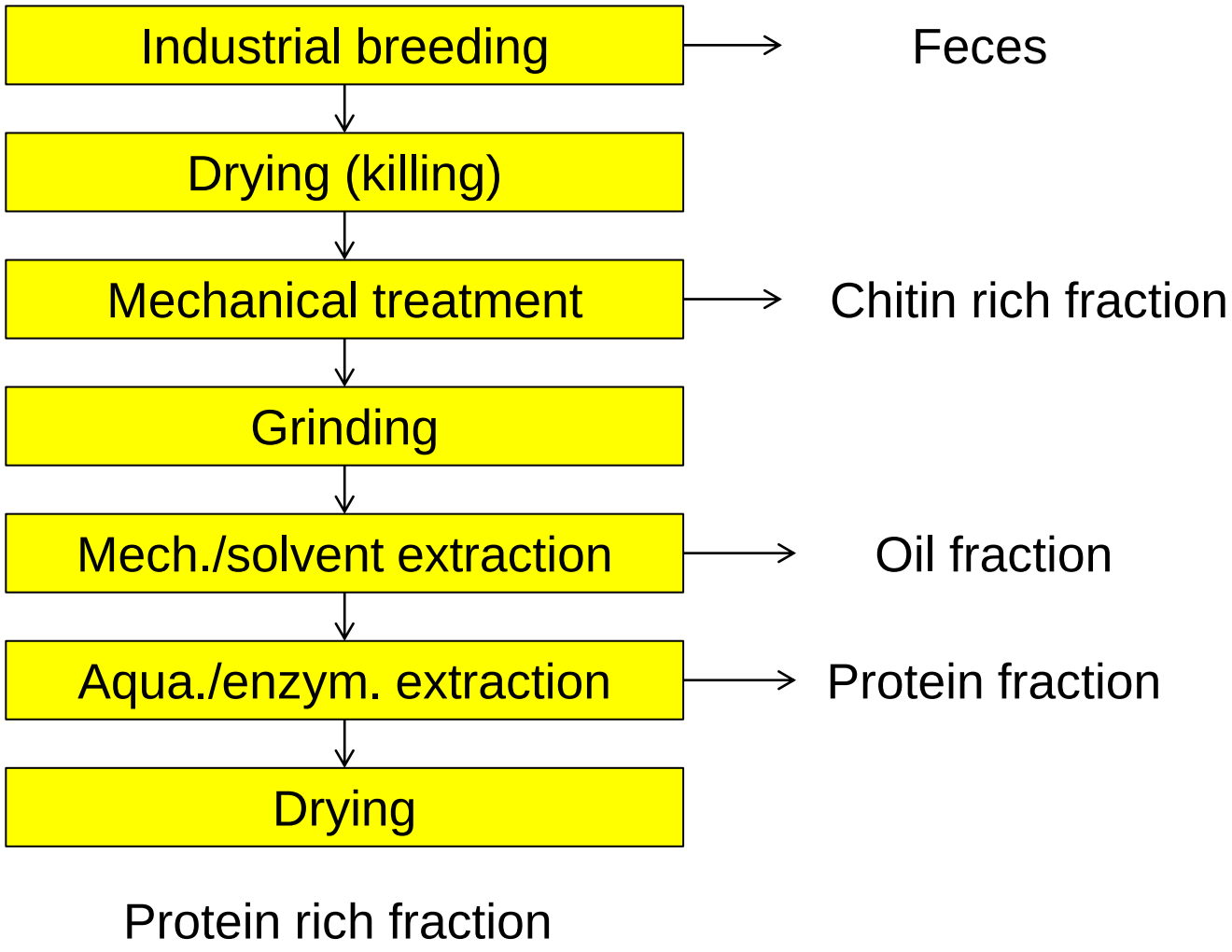
Locust processing



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Composition of locusts

		Locusta migratoria			*Schistocerca gregaria*		
		20 days	25 days	35 days	20 days	25 days	35 days
Moisture	%	69,1	67,3	59,5	71,7	68,9	59,8
Protein	%	17,6	19,2	21,8	16,3	19,7	24,6
Fat	%	7,3	8,6	12,5	5,2	6,8	10,2
Ash	%	3,6	3,8	3,8	4,2	3,7	5,1
Protein	% (dw)	57	59	54	58	63	61
Fat	% (dw)	24	26	31	18	22	25

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Protein and fat profile of locusts

Essential amino acids

		Locusta m. 25 days	*Schist. g.* 25 days
Lysine	**%**	3,0	3,7
Threonine	**%**	2,6	2,9
Valine	**%**	4,1	4,4
Isoleucine	**%**	2,7	2,9
Leucine	**%**	4,2	4,8
Histidine	**%**	1,9	2,0
Tryptophane	**%**	0,5	0,5
Cys + Met	**%**	0,9	1,2

Fatty acids

		Locusta m. 25 days	*Schist. g.* 25 days
C 12:0	**%**	0,2	0,2
C 14:0	%	2,1	1,8
C 16:0	**%**	27,5	26,7
C 16:1	**%**	1,1	1,1
C 17:0	**%**	0,2	0,2
C 18:0	**%**	6,1	7,9
C 18:1	**%**	38,3	32,0
C 18:2	**%**	17,4	23,7
C 18:3	**%**	6,7	6,0
C 20:0	**%**	0,2	0,2
C 20:1	**%**	0,1	0,1
C 20:2	**%**	0,05	0,06
C 22:0	**%**	0,01	

Black soldier fly (*Hermetia illucens*)

BSF is a fly of the soldier flies (stratiomyidae)

tropical insect, prefers 24 – 40 ºC; size: 13...20 mm

larvae live on fouling organic material

degrade and convert organic substrates to protein, fat and compost

1 g of eggs turns into 2.4 kg proteins

Nutrient	(based on 88% dry matter)
Protein	39,2 %
Fat	35,7 %
Ash	9,02 %
Energy content	8.342 kJ/kg (0,68 kJ/insect)
Calcium	24,07 mg/g

Source: Katz, 2012

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Holometabolic life cycle

Search for Mating Partner

Mating

Egg-Laying

Egg-Harvesting

Egg-Hatching

Young Larvae Growth

Larvae Growth

Pre-Pupae

Pupae

Metamorphosis

Hatching

Larvae processing

Feed formulation

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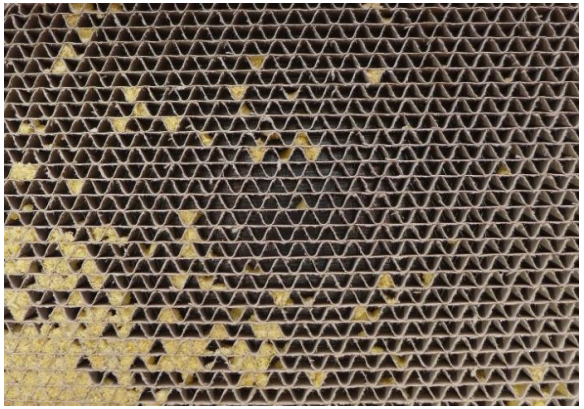
Hermetia breeding



Hermetia
Baruth GmbH

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Feedstuffs for larvae production

- ✓ Vegetal origin
- ✓ Former foodstuffs incl. dairy products and eggs
- ✗ Former foodstuffs incl. meat and fish
- ✗ Slaughterhouse products
- ✗ Catering waste
- ✗ Animal faeces
- ✗ …Others

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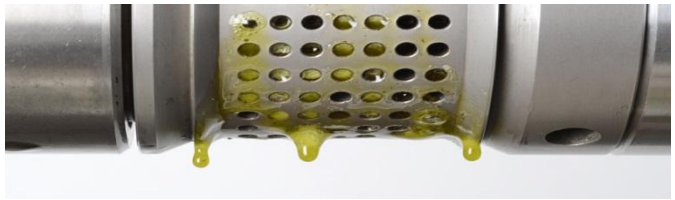
Feeding tests



tested		approved
✓	Pets	✓
✓	Fish: rainbow trout channel catfish blue tilapia	✗
✓	Poultry: chicken (broiler)	✗
✓	Further farm animals: pigs	✗

55% protein, 7% oil, 9% water

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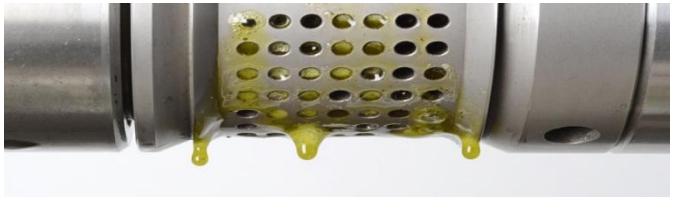
Fat properties

- saturated fatty acids: 77 %
- unsaturated fatty acids: 23 %
- possible uses:
  - feeding stuff
  - cleaning agents
  - rolling oil
  - protection against ticks



fatty acids		%
capric acid	C 10:0	1,1
lauric acid	**C 12:0**	**54,7**
myristic acid	C 14:0	8,1
palmitic acid	C16:0	11,9
palmitoleic acid	C16:1	2,7
stearic acid	C 18:0	1,2
oleic acid	C 18:1	10,1
linoleic acid	C 18:2	8,5

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Conclusions and Acknowledgements

Insects could be future protein sources for feed and food purposes.

They are able to convert side-streams into protein and oil with interesting amino acid and fatty acid profiles.

Industrial breeding and processing techniques are under development.

Reliable statutory rules are required (in EU).

Christian Spangenberg
Thomas Piofczyk

Reptile FOOD Handels- & Zucht GmbH

Hermetia Baruth GmbH

Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

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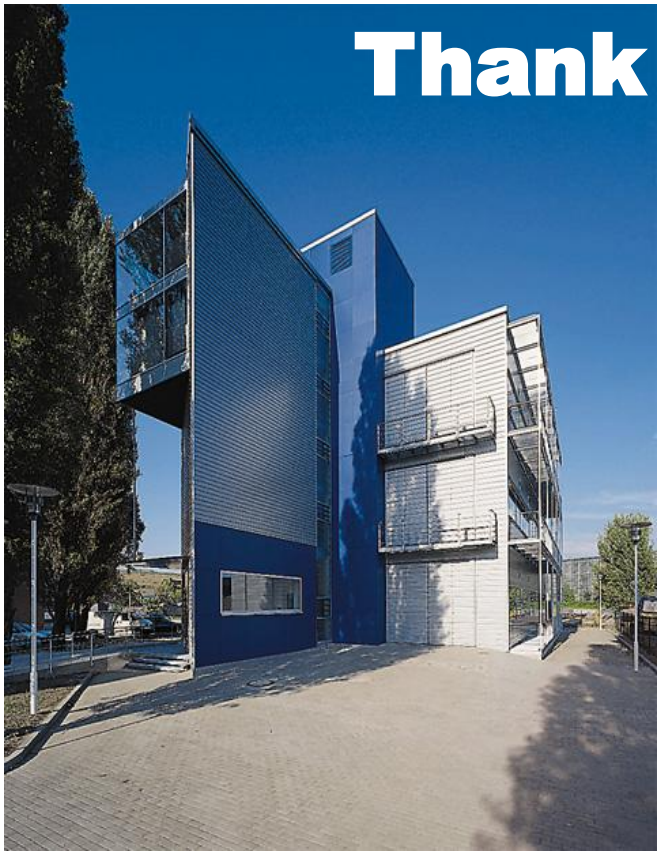

Thank You for Your Attention!

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