EAAP2019

Optimizing nutrition of black soldier fly larvae

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VIVES

Entomofood (Cornet: 2015-2017)

Entomatisation (TETRA/VLAIO: 2016-2018)

entomoSPEED

Interreg Vlaanderen-Nederland
Europees Fonds voor Regionale Ontwikkeling

(2017-2020)

BioBoost
Accelerating biobased horticulture

Interreg 2 Seas Mers Zeeën

(2017-2021)

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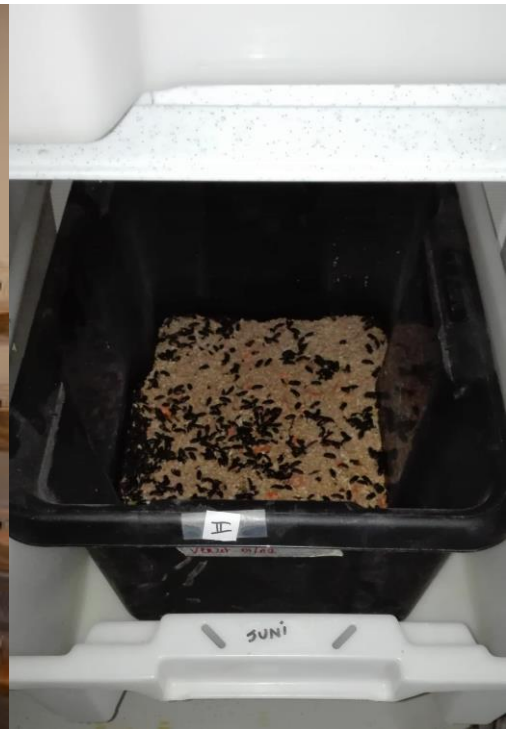
Goal

Rearing of two species: *T. molitor* and *H. illucens*



Goal

BSF

Assessing the value of different side streams ➔ most promising substrates or mixtures are being tested on larger scale

inagro
ONDERZOEK & ADVIES IN LAND- & TUINBOUW

Nutritional requirements are being assessed in order to select promising side streams to combine

Laboratory standard feed: chicken feed mixed with water (30/70)

- 5.4% protein (21% on DM)
- Larvae grow to maximum weight in 18 days (egg hatch-harvest)
- Resulting larvae contain 41% protein and 36% fat on DM
- Feed Conversion Ratio (Dry feed/Live insects) of 1.2

Nutritional requirements

Optimal nutrient composition of BSF feed

Nutritional requirements for BSF larvae are not well known

Protein content in the chicken feed standard is too high ➔

ammonia emissions

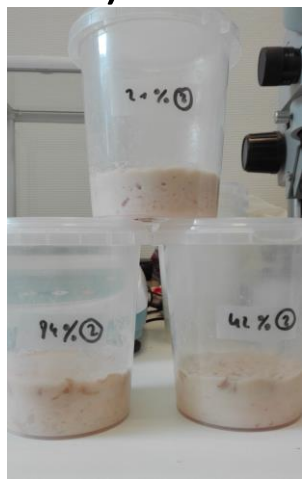
Most side streams of plant origin contain lower protein levels

Nutritional requirements

Optimal nutrient composition of BSF feed

Testing of diets with different protein levels and comparing to chicken feed

Per diet: 100 larvae receive 110 g wet feed (28 g DM) over 2 week period,
3 times replicated



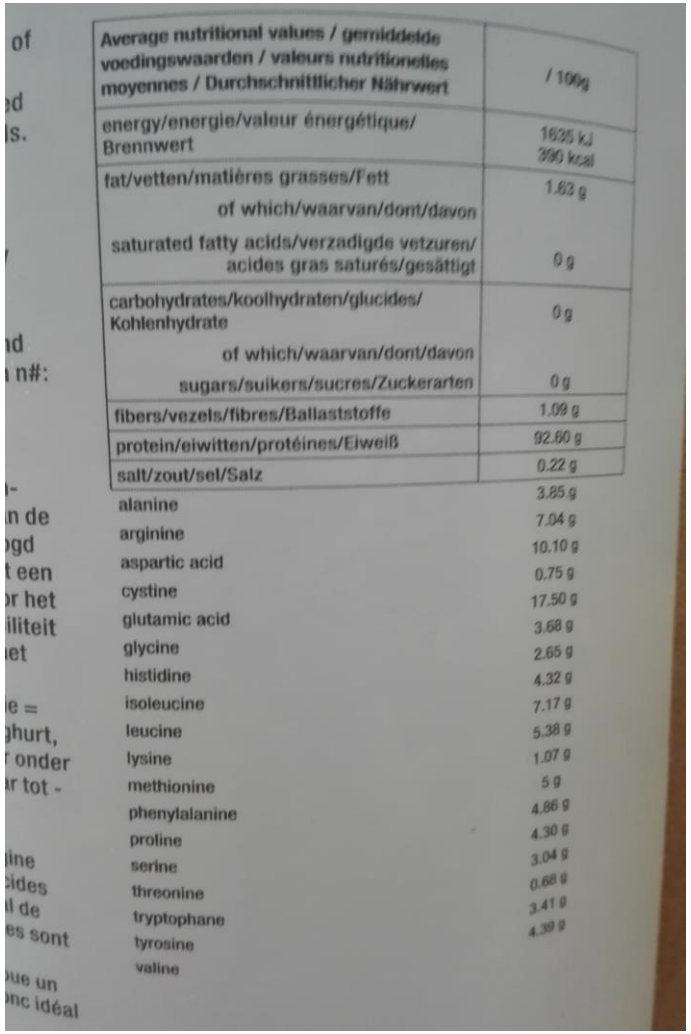
Using pure ingredients (artificial diets)

Iso-energetic substrates:

All substrates are high in starch (75-95% DM) ➔ only protein is limiting

Decrease in protein is compensated by starch (gross-energy)

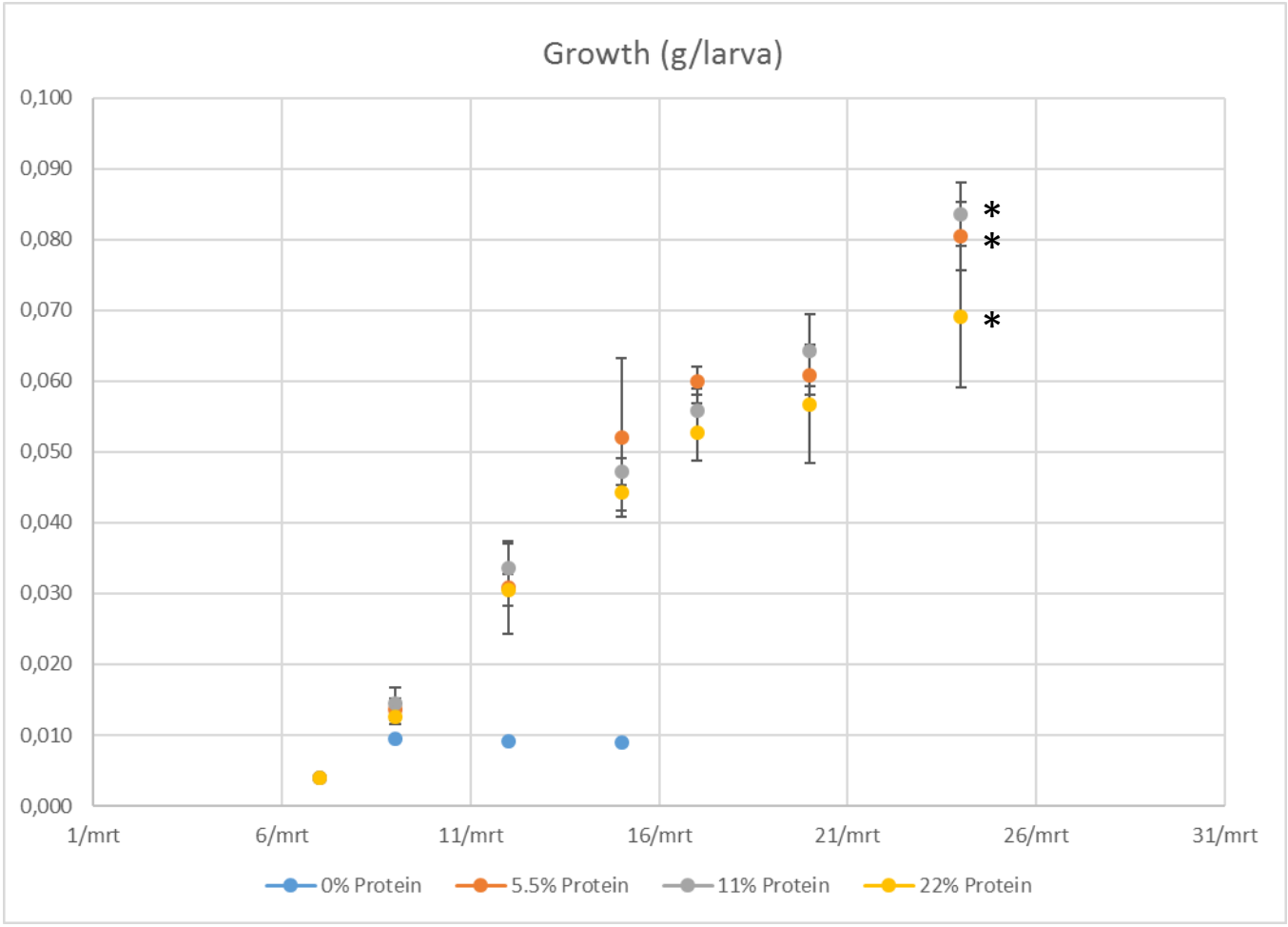
Nutritional requirements: protein and starch



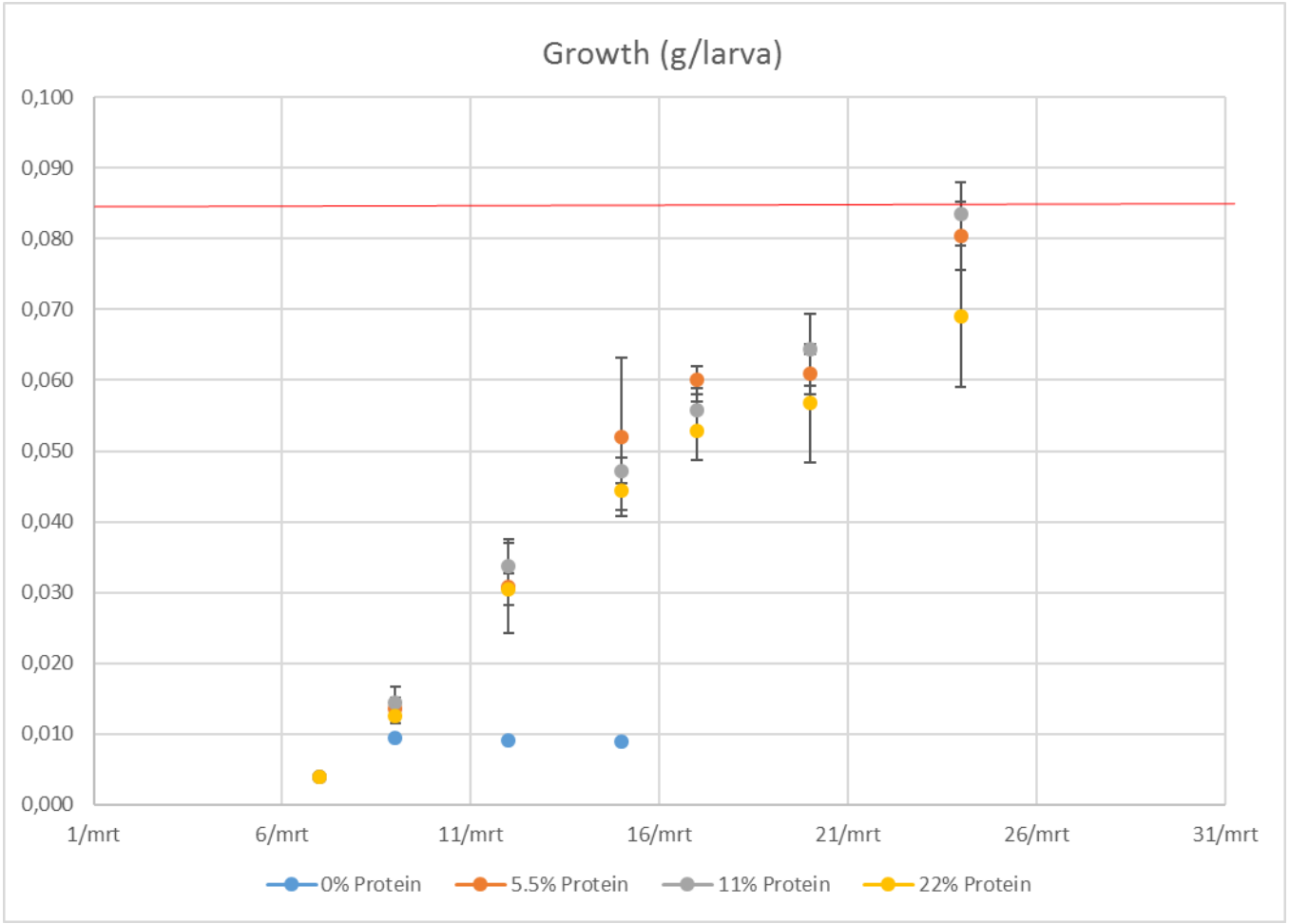
Average nutritional values / gemiddelde voedingswaarden / valeurs nutritionelles moyennes / Durchschnittlicher Nährwert	/ 100g
energy/energie/valeur énergétique/ Brennwert	1635 kJ 390 kcal
fat/vetten/matières grasses/Fett	1.63 g
of which/waarvan/dont/davon saturated fatty acids/verzadigde vetzuren/ acides gras saturés/gesättigt	0 g
carbohydrates/koolhydraten/glucides/ Kohlenhydrate	0 g
of which/waarvan/dont/davon sugars/suikers/sucres/Zuckerarten	0 g
fibers/vezels/fibres/Ballaststoffe	1.09 g
protein/eiwitten/protéines/Eiweiß	92.60 g
salt/zout/sel/Salz	0.22 g

alanine	3.85 g
arginine	7.04 g
aspartic acid	10.10 g
cystine	0.75 g
glutamic acid	17.50 g
glycine	3.68 g
histidine	2.65 g
isoleucine	4.32 g
leucine	7.17 g
lysine	5.38 g
methionine	1.07 g
phenylalanine	5 g
proline	4.86 g
serine	4.30 g
threonine	3.04 g
tryptophane	0.68 g
tyrosine	3.41 g
valine	4.39 g

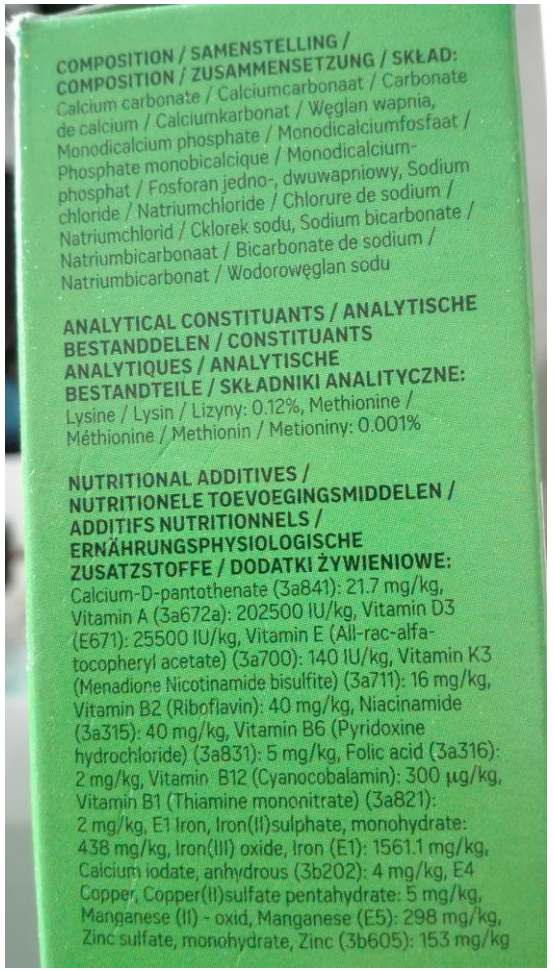
Nutritional requirements: protein and starch



Nutritional requirements: protein and starch



Nutritional requirements: protein, starch and vitamins + minerals



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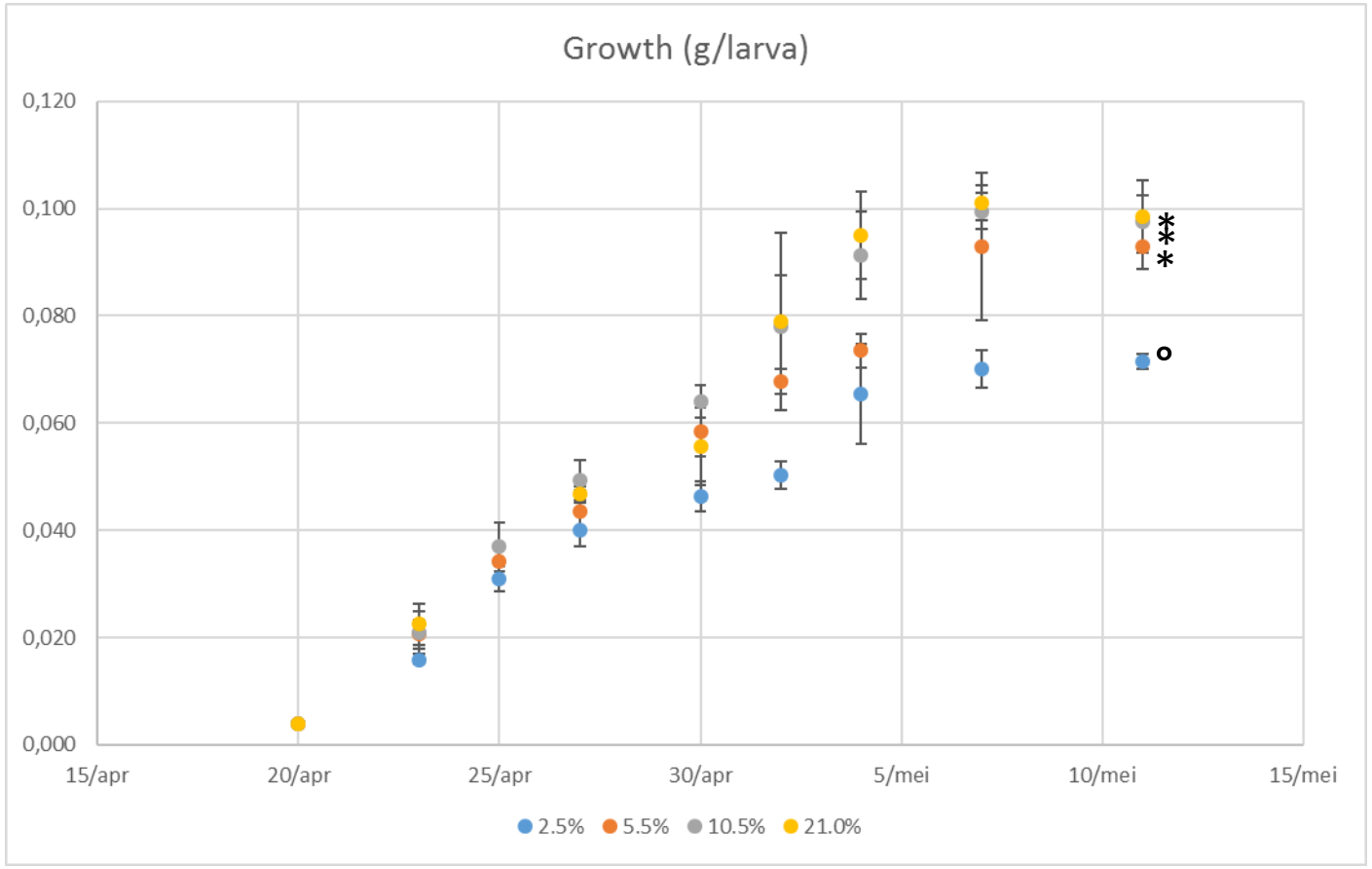
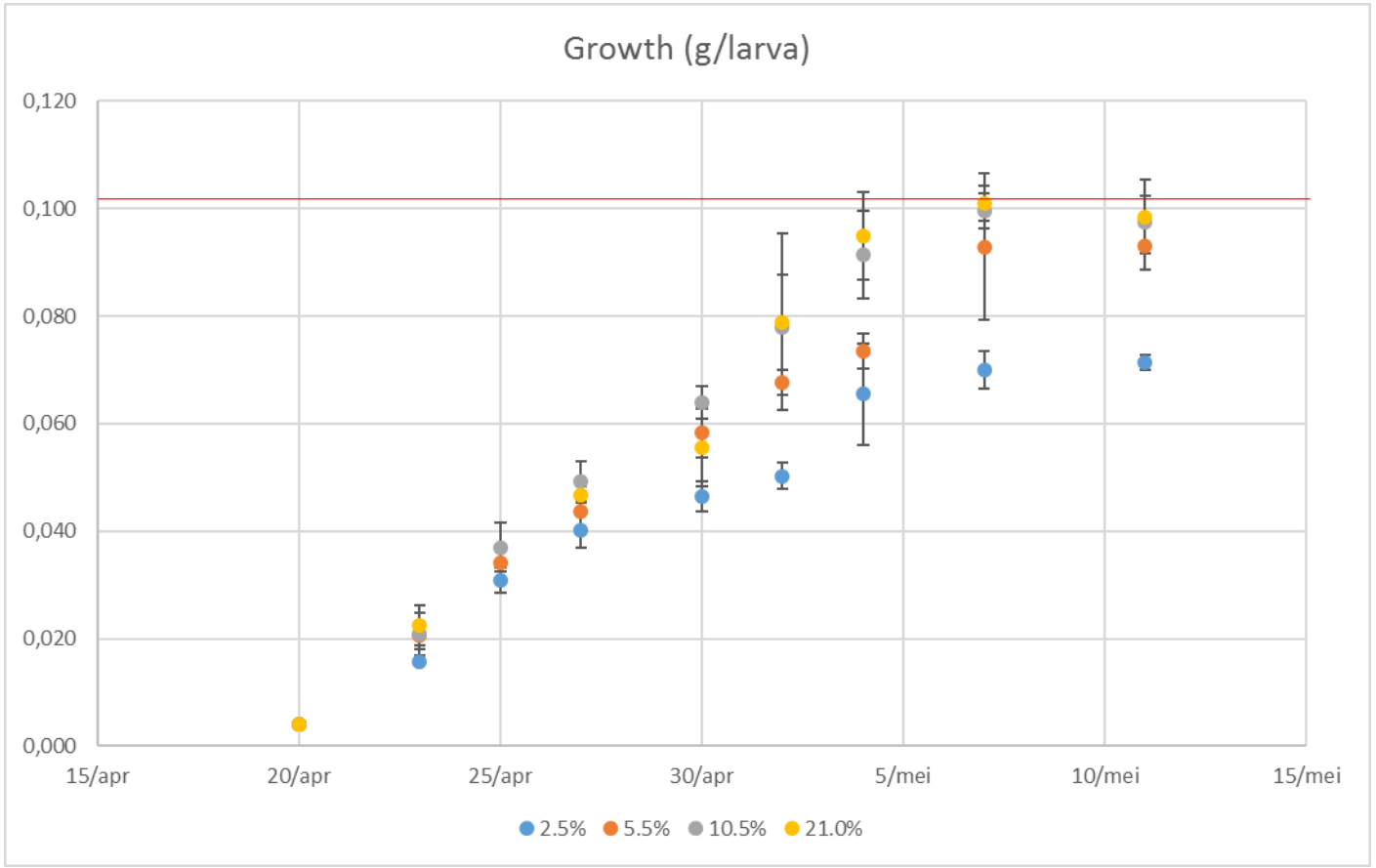


Nutritional requirements: protein, starch and vitamins + minerals

25%



Nutritional requirements: protein, starch, vitamins+minerals and fat

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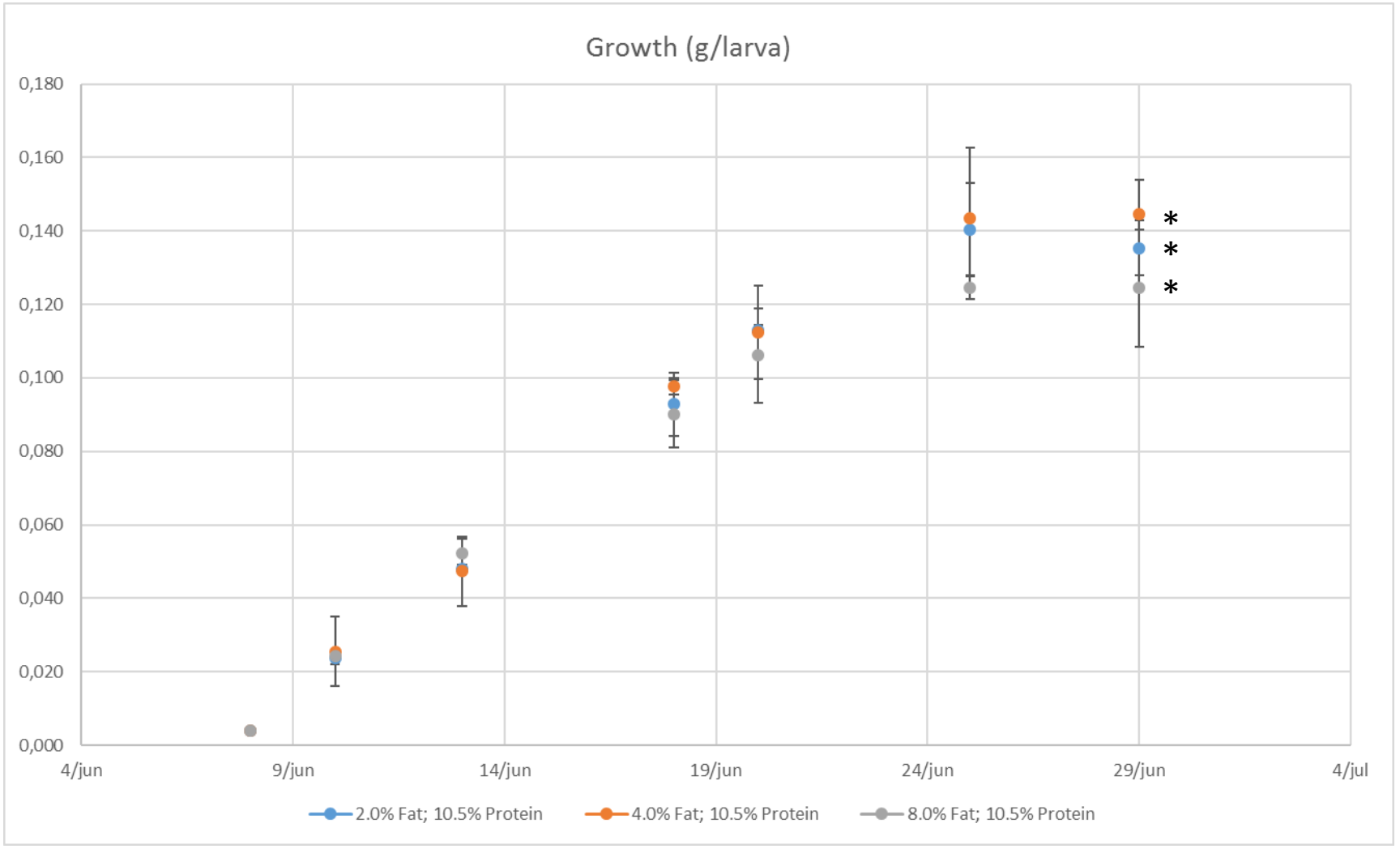
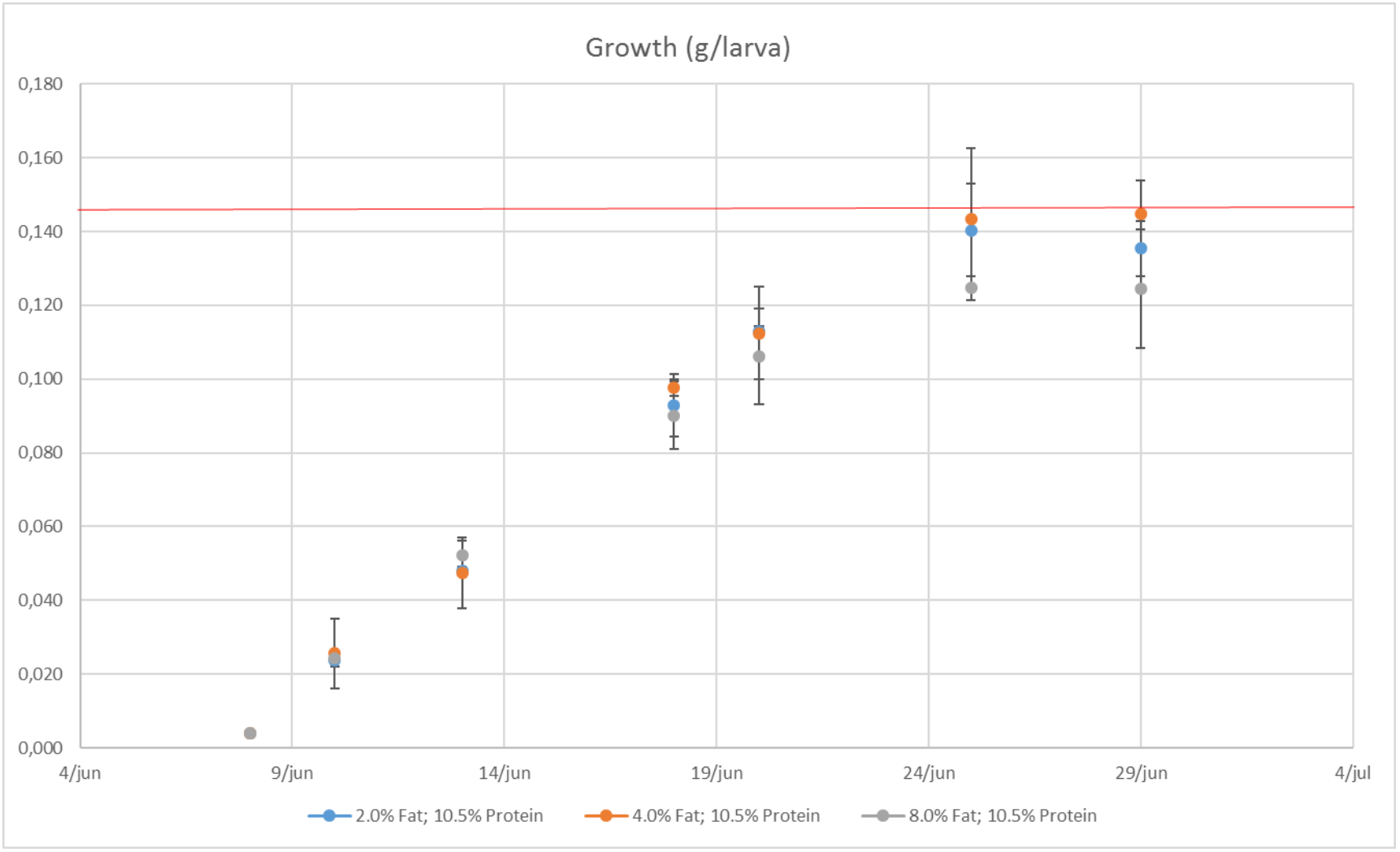
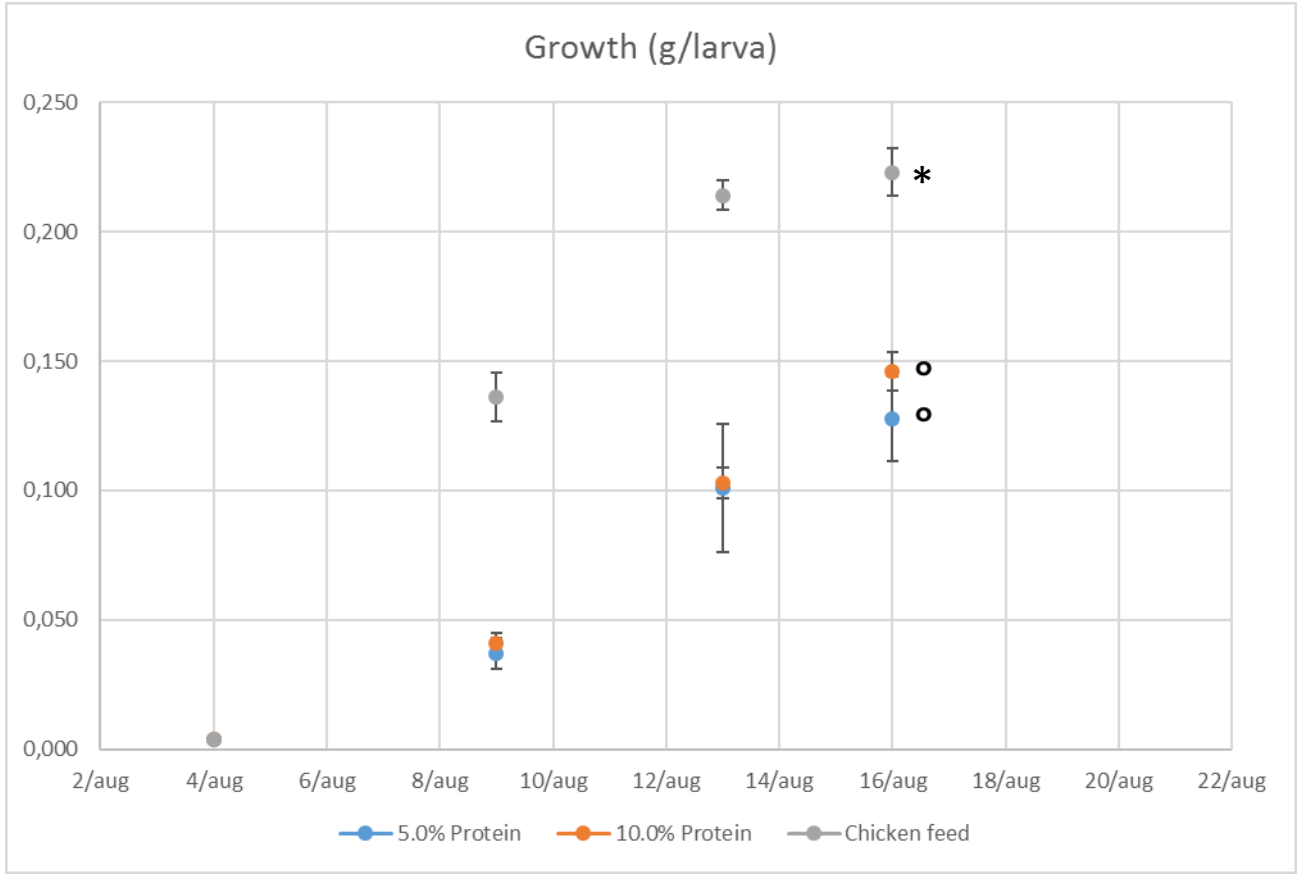


Nutritional requirements: protein, starch, vitamins+minerals and fat

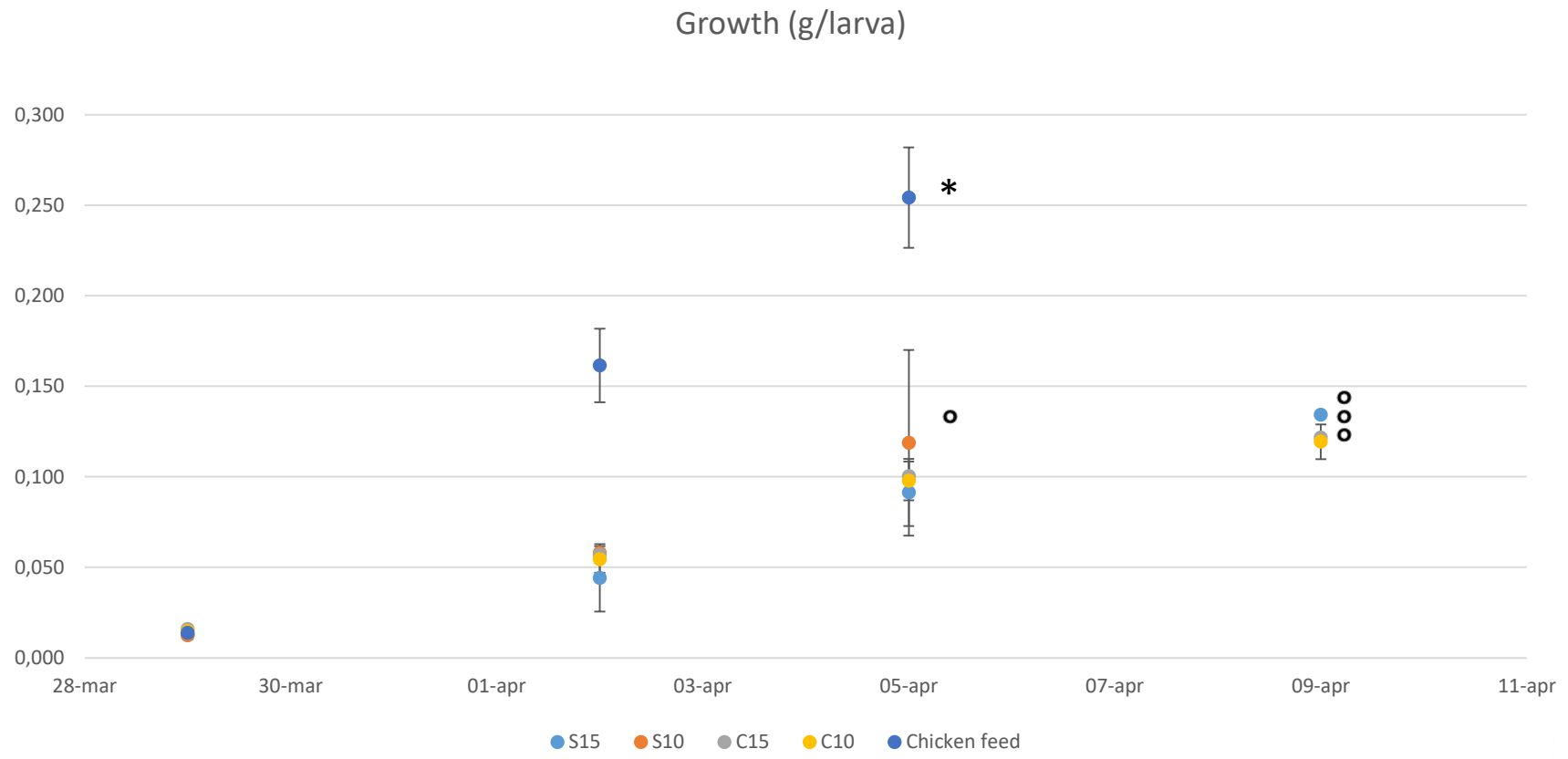
85%



Nutritional requirements: one time feeding



Nutritional requirements: different protein sources



Nutritional requirements: discussion

BSF larvae require only 25 – 50% of the protein level in chicken feed

Restrictions artificial diets:

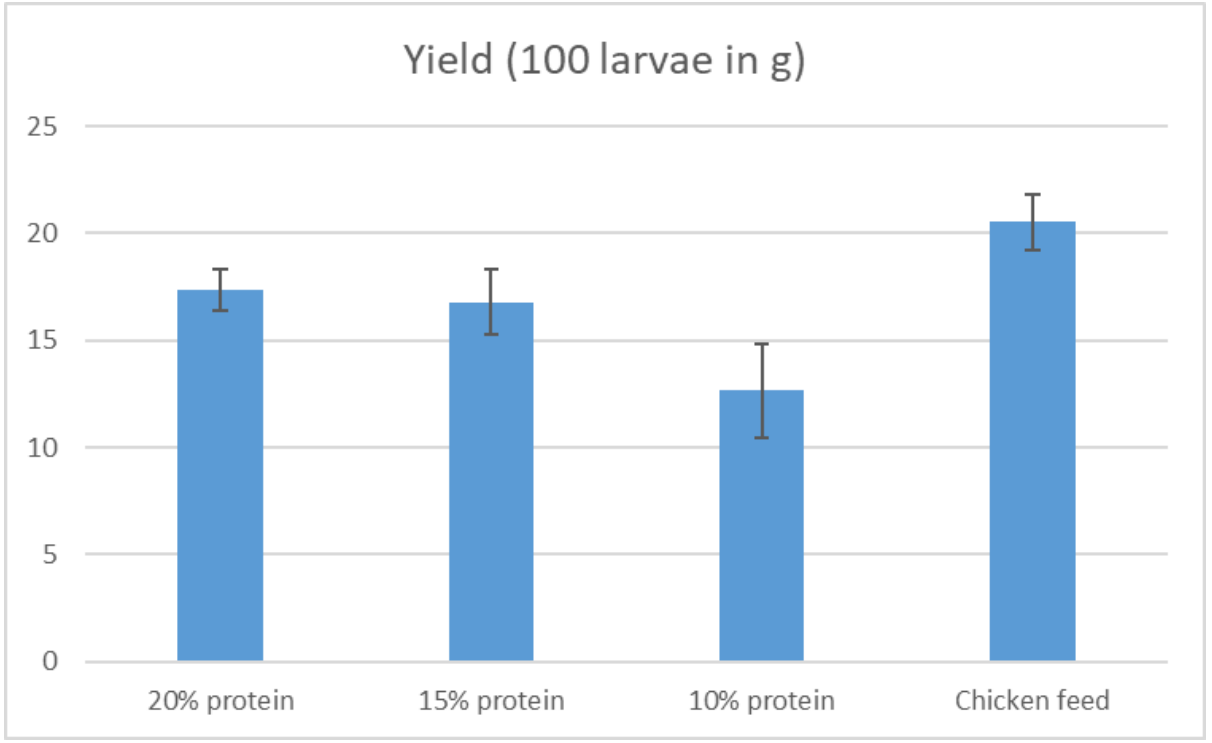
- Larvae grow maximum until 75% compared to chicken feed diet, despite all (macro)nutrients being present and high energy levels
  - Shortage of micronutrients?
  - Cholesterol? (Barragán-Fonseca, 2018)
  - Digestibility of carbohydrates (resistant starch)?
  - Structure and other properties of the substrate?

Nutritional requirements: discussion

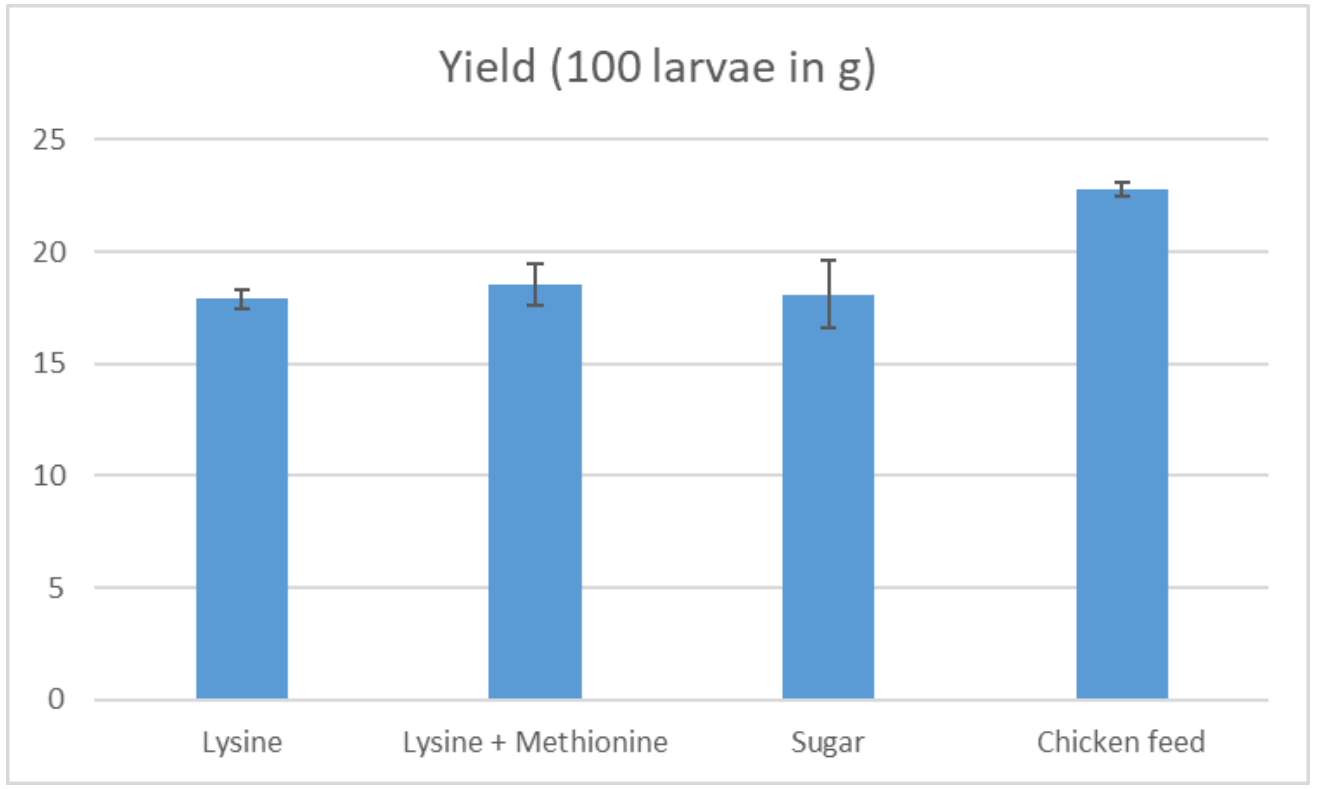
Nutritional requirements: semi-artificial diets

20% Protein	15% Protein	10% Protein	Chicken feed
50 g Chicken feed/water	50 g Chicken feed/water	50 g Chicken feed/water	100 g Chicken feed/water
6.85 g Sugar	8.30 g Sugar	9.75 g Sugar	
3.00 g Protein	1.50 g Protein		

Nutritional requirements: semi-artificial diets



Nutritional requirements: semi-artificial diets



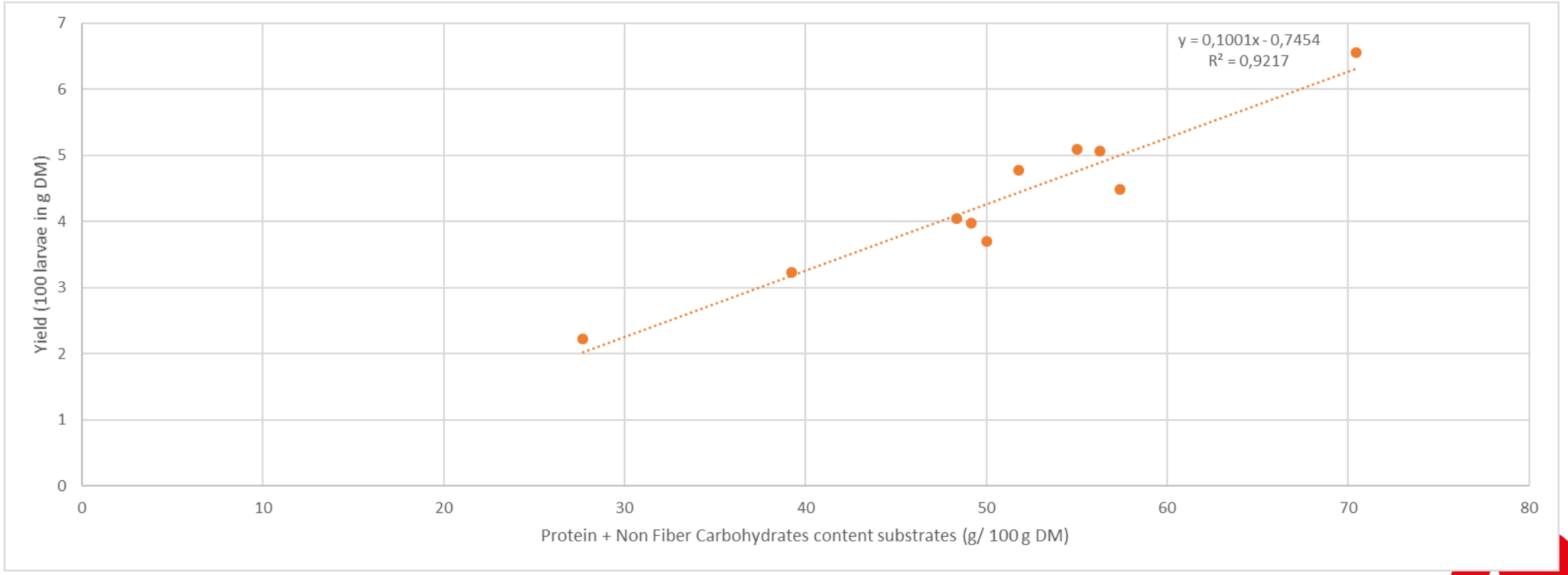
Nutritional requirements: future perspectives

Further testing different mixtures with synthetic amino acids ➔ identifying essential amino acids

Identifying other essential nutrients (fatty acids, sterols, vitamins and minerals)

Assessing the digestibility of nutrients and trying to improve it (enzymes, microorganisms,…)

Nutritional requirements: future perspectives



Thank you for your attention!

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Insectinfo.be