



Descriptive sensory analysis of edible insects in Czechia: tasty or nasty? and does size really matter?

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Basic facts about Edible Insects

- + Rapid life cycle = high biomass gain
- + Low requirements on use of land, water and feed
- + Rich in proteins and fat
- ? Food safety
- ? Acceptance



Basic facts about Czechs

- Lovers of unhealthy foods
- World champions in beer consumption *per capita*
- Naturally neophobic
- Experts of everything
- Scarce records of entomophagy from the past
- Wear socks in sandals

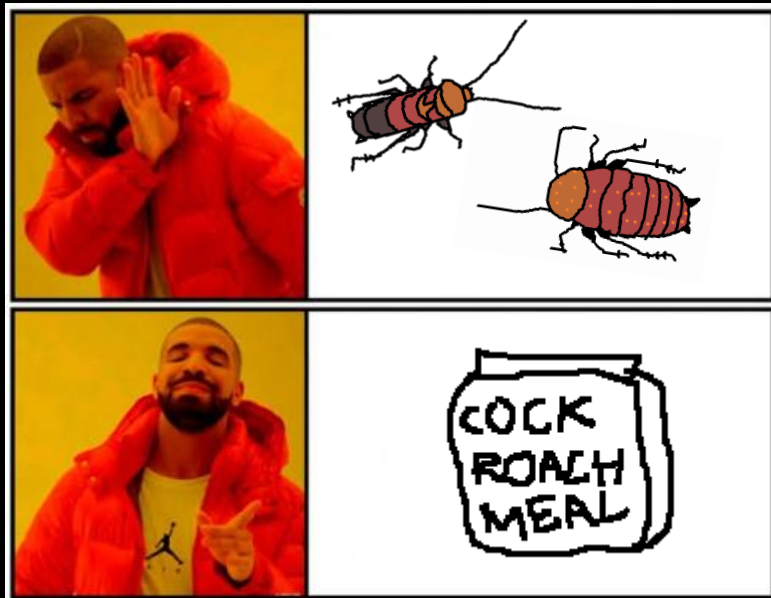


Willingness to eat insects in Czechia 2021

- Questionnaire survey
- 10 questions in Czech
- Distributed online and in-person
- Pearson's chi-square and Fishers exact tests
- Logistic regression model



Questionnaire survey, 2021



37.8% of the 1,340 respondents had experienced eating insects

11.8% (60) consumed insects regularly

Low willingness to taste insects of people unexperienced with entomophagy (14%)

Insect meal (regardless of the species) was rated better than whole insects (crickets best, cockroaches worst)

Sensory analysis, 2022

Scientific question 1: There is no species-related preference in liking of familiar products containing insect meal.

Scientific question 2: Species and size matter when consuming whole insects.

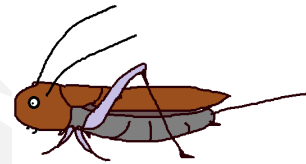


Sensory analysis, 2022 methods

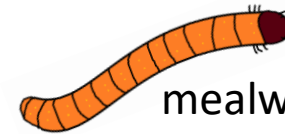
- insects were obtained from laboratory colonies at CZU and NIPH
- Small and large species of Blattodea, Coleoptera, and Orthoptera were assessed in whole and ground form



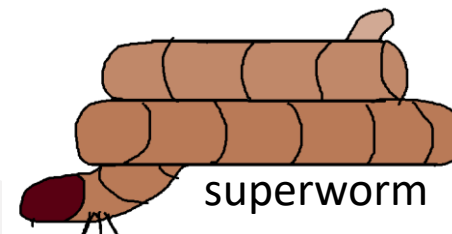
cricket



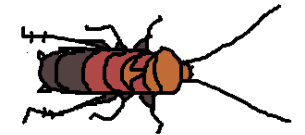
locust



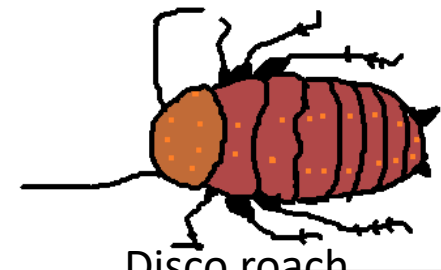
mealworm



superworm



Red runner roach



Disco roach

Sensory analysis, 2022 methods

- Insects were freeze-killed (dried and homogenized for insect meal evaluation)
- Whole insects: fried, salty
- Insect meal: cookies and white bread (10 % replacement of wheat flour)



Martin, work!!



Sensory analysis, 2022 methods

- Panel of 16 trained assessors
- Profilic sensory evaluation
- Ranking test
- Paired preference test





Profiling sensory evaluation whole insects

Order	Insects	Pleasantness of sample before tasting	Pleasantness of				Sample acceptance after tasting	Preference test**
			color	smell	texture	taste		
Coleoptera	mealworm	59±22 ^{abc}	59±20 ^a	55±17 ^a	59±22 ^a	66±19 ^a	64±13 ^a	12
	superworm	32±22 ^{bcde}	41±22 ^a	51±23 ^a	43±23 ^a	45±22 ^{abc}	46±26 ^a	4
Orthoptera	field cricket	37±21 ^{abcde}	45±21 ^a	54±17 ^a	52±23 ^a	67±21 ^a	65±21 ^a	12
	locust	28±22 ^{cde}	48±23 ^a	48±20 ^a	40±25 ^a	51±25 ^{abc}	49±27 ^a	4
Blattodea	red runner roach	55±19 ^{abcd}	59±19 ^a	55±19 ^a	45±23 ^a	32±20 ^c	41±21 ^a	2
	disco roach	22±23 ^{cde}	39±26 ^a	67±22 ^a	46±23 ^a	64±24 ^a	67±20 ^a	14

0=disgusting; 100=excellent



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Profiling sensory evaluation cookies

Order	Sample	Pleasantness of color	Pleasantness of smell	Pleasantness of texture	Overall pleasantness of taste	Overall sample acceptance
Coleoptera	mealworm	82±17 ^a	74±17 ^a	68±27 ^a	74±18 ^a	70±20 ^a
	superworm	74±19 ^a	77±18 ^a	74±20 ^a	79±17 ^a	80±14 ^a
Orthoptera	field cricket	81±19 ^a	76±14 ^a	74±15 ^a	79±12 ^a	78±15 ^a
	locust	81±17 ^a	77±17 ^a	71±20 ^a	75±22 ^a	77±17 ^a
Blattodea	red runner roach	74±18 ^a	71±17 ^a	61±32 ^a	61±26 ^a	59±26 ^a
	discoid roach	83±15 ^a	66±22 ^a	68±23 ^a	57±27 ^a	61±26 ^a
Control		82±16 ^a	74±17 ^a	60±25 ^a	67±20 ^a	69±15 ^a

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	superworm	74±19 ^a	77±18 ^a	74±20 ^a	79±17 ^a	80±14 ^a
Orthoptera	field cricket	81±19 ^a	76±14 ^a	74±15 ^a	79±12 ^a	78±15 ^a
	locust	81±17 ^a	77±17 ^a	71±20 ^a	75±22 ^a	77±17 ^a
Blattodea	red runner roach	74±18 ^a	71±17 ^a	61±32 ^a	61±26 ^a	59±26 ^a
	discoid roach	83±15 ^a	66±22 ^a	68±23 ^a	57±27 ^a	61±26 ^a
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Orthoptera	field cricket	81±19 ^a	76±14 ^a	NO SIGNIFICANT DIFFERENCES		
	locust	81±17 ^a	77±17 ^a			
Blattodea	red runner roach	74±18 ^a	71±17 ^a	61±32 ^a	61±26 ^a	59±26 ^a
	discoid roach	83±15 ^a	66±22 ^a	68±23 ^a	57±27 ^a	61±26 ^a
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Profiling sensory evaluation white bread

Order	Sample	Pleasantness of color	Pleasantness of smell	Pleasantness of texture	Pleasantness of taste	Overall sample acceptance
Coleoptera	mealworm	41±27 ^{cd}	64±26 ^{ab}	77±14 ^a	70±19 ^{ab}	63±23 ^{abc}
	superworm	76±21 ^{abc}	70±21 ^{ab}	72±22 ^a	58±29 ^{ab}	63±25 ^{abc}
Orthoptera	field cricket	45±21 ^{bcd}	68±18 ^{ab}	64±22 ^a	67±18 ^{ab}	72±14 ^{ab}
	locust	60±27 ^{abcd}	61±24 ^{ab}	57±29 ^a	53±26 ^b	54±20 ^{bc}
Blattodea	red runner roach	72±17 ^{abc}	40±24 ^{bc}	73±13 ^a	46±30 ^b	48±29 ^c
	discoid roach	74±15 ^{abc}	30±19 ^c	66±20 ^a	38±27 ^b	35±25 ^c
Control		79±26 ^{ac}	82±20 ^{ab}	82±16 ^a	85±15 ^a	82±18 ^{ab}

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Orthoptera	field cricket	45±21 ^{bcd}	68±18 ^{ab}	64±22 ^a	67±18 ^{ab}	72±14 ^{ab}
	locust	60±27 ^{abcd}	61±24 ^{ab}	57±29 ^a	53±26 ^b	54±20 ^{bc}
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Results of hedonic ranking test

Ranking whole insects		Ranking ground insects: bread		Ranking ground insects: cookies	
Insects	Rank sum	Insects	Rank sum	Insects	Rank sum
mealworm	75 ^a	control	93 ^a	locust	77 ^a
discoid roach	70 ^a	field cricket	72 ^{ab}	superworm	74 ^a
field cricket	60 ^a	mealworm	70 ^{ab}	mealworm	71 ^a
locust	58 ^{abc}	superworm	68 ^b	field cricket	71 ^a
red runner roach	38 ^{bc}	locust	58 ^{bc}	red runner roach	56 ^a
superworm	35 ^c	red runner roach	49 ^{bc}	control	50 ^a
		discoid roach	38 ^c	discoid roach	49 ^a



Rank sum = sum of order of samples from 16 evaluators

Results of hedonic ranking test

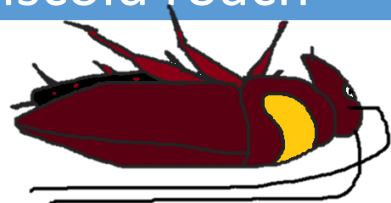
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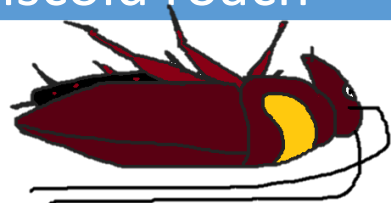
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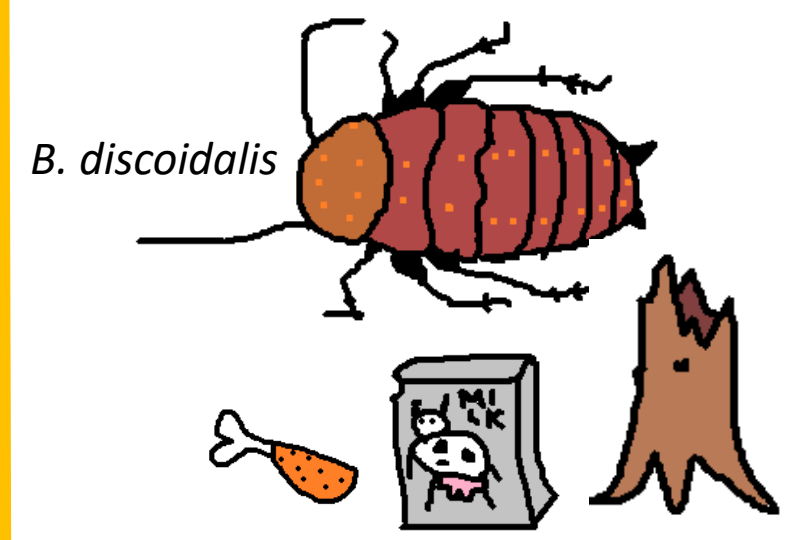
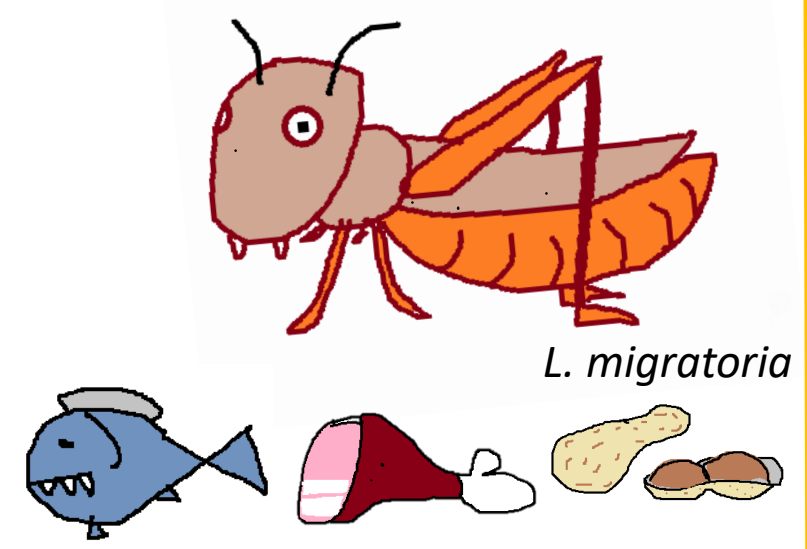
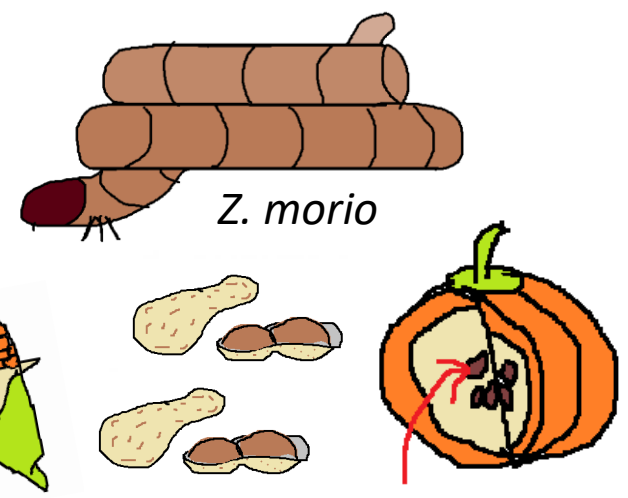
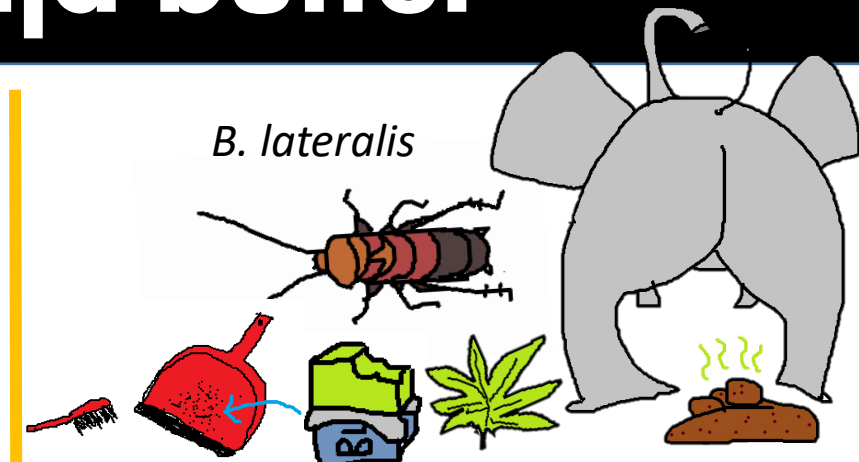
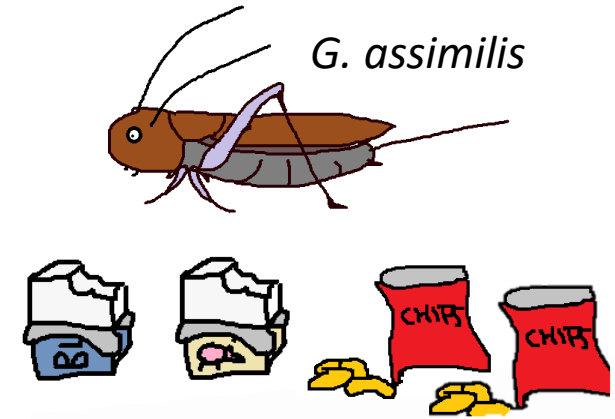
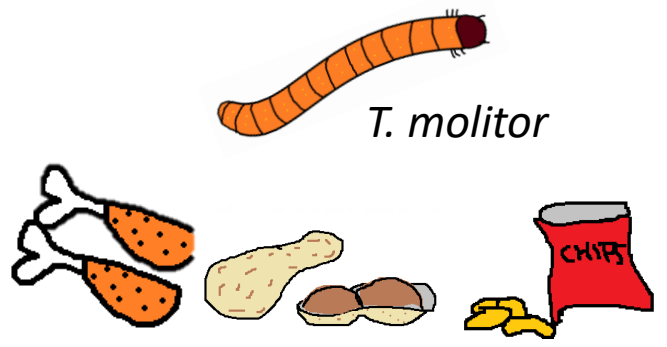
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The off-flavors reported by assessors: from chicken legs to ganja butter



Take away messages

The **hidden form of consumptions is preferred** than that of whole insects

The **acceptance of whole insects (except *B. lateralis*) increased** after tasting

Mealworm and field cricket meal were comparable to control bread

No effect of insect meal on cookies evaluation

Czechs really wear socks in sandals

Journal of Insects as Food and Feed, 2020 online

ARTICLE IN PRESS



Insect consumption in the Czech Republic: what the eye does not see, the heart does not grieve over

M. Kulma^{1,2,*}, V. Tůmová², A. Fialová³ and L. Kouřimská⁴

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<https://doi.org/10.1080/10942912.2022.2161569>



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A descriptive sensory evaluation of edible insects in Czechia: do the species and size matter?

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**Thank you
for your
attention.**

Michal
Kurečka

Dora
Petříčková

Petra
Škvorová

Lenka
Kouřimská

Karolína
Bartáková