Un soldado en la caficultura
Hermetia illucens

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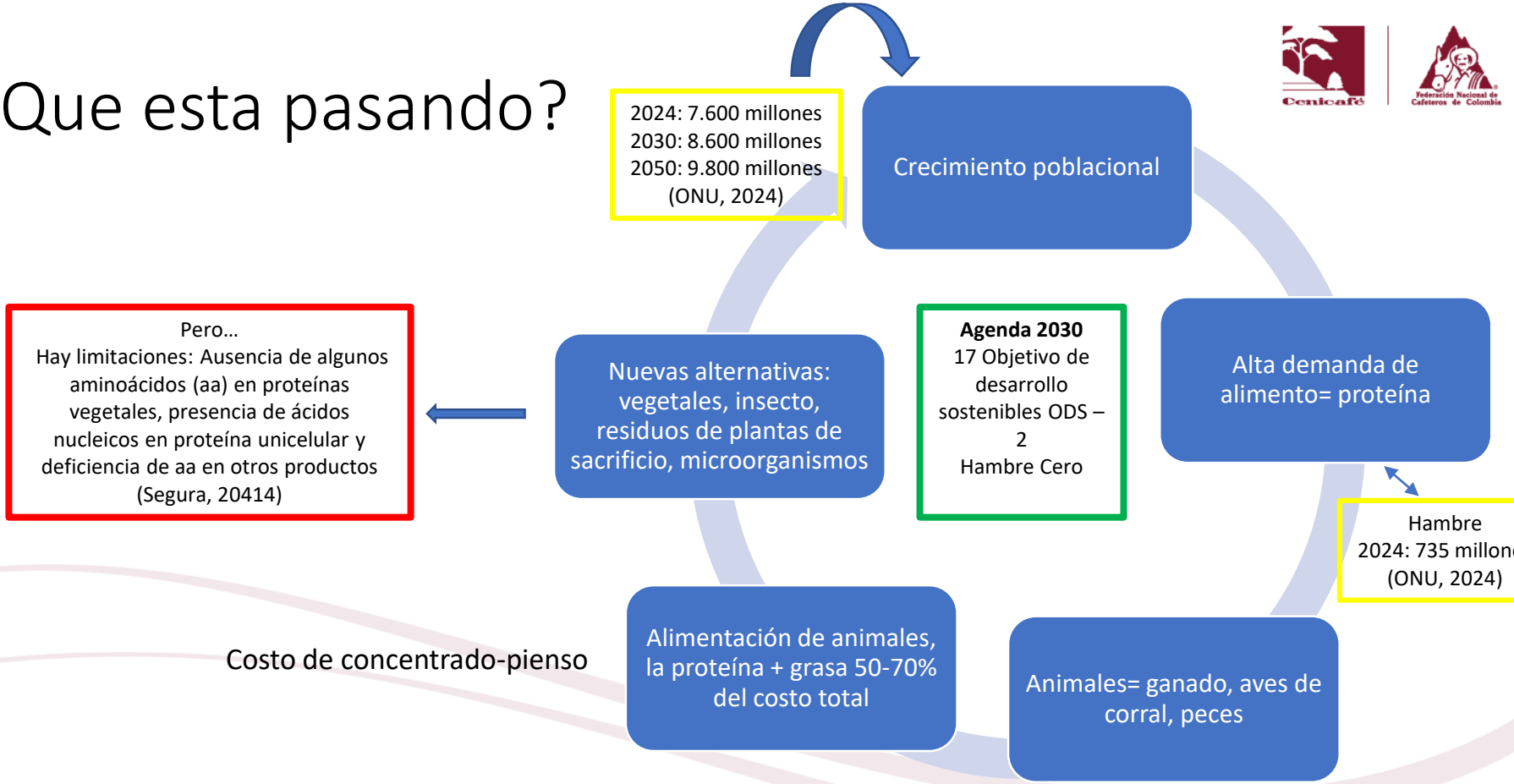
Abril 22 de 2024

Hermetia illucens. (2024).
In *Wikipedia*. https://es.wikipedia.org/wiki/Hermetia_illucens

Que esta pasando?



Costo de concentrado-pienso

Líos en producción, área, deforestación, desertificación, cambio climático, CO_2, mercado, p.ej. Pacto verde europeo

Diversas culturas dentro de su dieta consumen insectos

Orugas mopanes- SurAfrica

Hormigas-Colombia

Chapulines-Mexico

Mojojoy-suri – Perú, Colombia

Los insectos se consideran una fuente de alimento EXTRAVAGANTE y POCO ATRACTIVA EN HUMANOS – FAO(2021)

2.000 especies de insectos comestibles (Van Huis, 2013)

Problema:
Que no los queremos comer

Aceptación social
Cargas microbianas

Solución temporal

Alimento para animales de explotación pecuaria:
Ganado, cerdos, aves de corral, peces
Para animales de estimación: lagartos, tortugas, peces de acuario, snacks para perro y gatos

Tenebrio mollitor

Locusta migratoria

Acheta domesticus

Alphitobius diaperinus

Unión Europea (UE,2022) autorizó

EFSA

(Agencia Europea de seguridad Alimentaria)

Bioeconomía circular

Fuente: Rodríguez-Valencia, N. 2023, adaptado de DANE, 2020

Balance de materia en el beneficio e industrialización del café

Fuente: Rodríguez-Valencia, N. 2023

Pulpa de café

- Materia prima para la elaboración de abonos orgánicos,
- Producción de proteína animal,
- Cultivo de hongos comestibles y medicinales,
- Producción de biocombustibles sólidos, líquidos y gaseosos,
- Elaboración de pectinas, plásticos, cartón,
- Producción de bebidas estimulantes
- Harina para panadería y repostería
- Entre otros usos.

Subproductos del café

- Abono orgánico= pulpa + aguas mieles

Para una finca que produce 1,000 @ CPS= ~27 toneladas de pulpa fresca (~44%)

Compostaje

1,1 toneladas de abono orgánico (en base de materia seca)

Fuente: Rodríguez-Valencia, 2023.

Pero además de abono orgánico, se pueden obtener otros productos?

El abono orgánico…

- Lombricompostaje de pulpa sola o con aguas mieles

- Larvicompostaje de pulpa sola o mezcla con aguas-mieles

Como inicio esta historia de las moscas soldado negra y café (Cenicafé)

- Año 2011….
- Nelson Rodríguez, me pregunto que sabia de esas moscas,
- Y allí empezó todo
- RNC2501 - Transformación de la pulpa de café mediante larvas de la mosca *Hermetia illucens* (2011-2013) – Liderada N. Rodríguez

REPORT FOR MIKE WILLIAMS

DIRECTOR OF THE ANIMAL AND POULTRY WASTE MANAGEMENT CENTER, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NC

AGREEMENTS BETWEEN THE NC ATTORNEY GENERAL, SMITHFIELD FOODS, AND PREMIUM STANDARD FARMS, AND FRONTLINE FARMERS

USING THE BLACK SOLDIER FLY, *Hermetia illucens*, AS A VALUE-ADDED TOOL FOR THE MANAGEMENT OF SWINE MANURE

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June 6, 2005

EXECUTIVE SUMMARY

Previously reported work has shown that black soldier flies (*Hermetia illuscens*) are effective in reducing the mass as well as the nutrient and moisture content of hen manure. Preliminary results from using the black soldier fly to digest swine manure solids suggested that the system could be even more effective for swine manure. A small scale system for digesting swine manure solids, harvested by a belt beneath a slatted floor holding pigs, was installed and tested. Manure mass was reduced 56% while the concentrations of most elements and nutrients were reduced 40 to 55 %. Nutrient analyses and feeding studies indicate that dried black soldier fly prepupae grown on swine manure solids have value as a feedstuff, particularly for aquaculture. In a pot study, plant growth was increased when the digested manure residue was added to either a clay soil or clean sand.

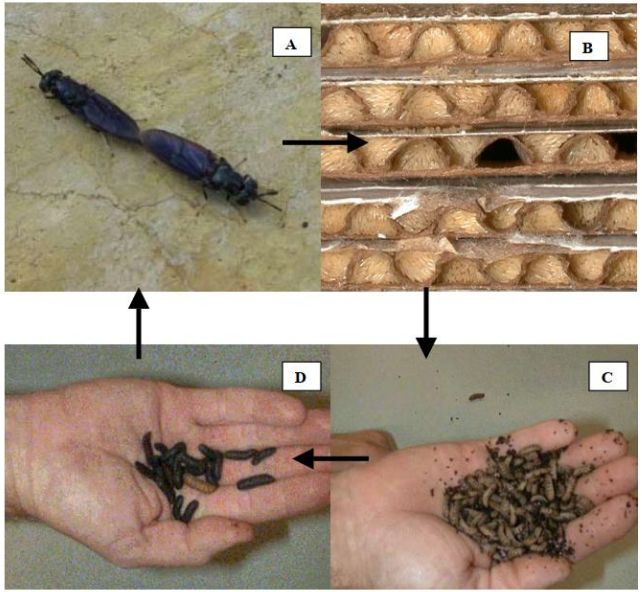


Table 1. Percent amino acid content of dried soldier fly larvae fed either beef (Newton et al. 1977) or swine manure.					
Essential Amino Acids			Additional Amino Acids		
	Beef	Swine		Beef	Swine
Methionine	0.9	0.83	Tyrosine	2.5	2.38
Lysine	3.4	2.21	Aspartic acid	4.6	3.04
Leucine	3.5	2.61	Serine	0.1	1.47
Isoleucine	2.0	1.51	Glutamic acid	3.8	3.99
Histidine	1.9	0.96	Glycine	2.9	2.07
Phenylalanine	2.2	1.49	Alanine	3.7	2.55
Valine	3.4	2.23	Proline	3.3	2.12
l-Arginine	2.2	1.77	Cystine	0.1	0.31
Threonine	0.6	1.41	Ammonia	1.3	--
Tryptophan	0.2	0.59			

Table 2. Mineral content and proximate analysis of dried black soldier fly prepupae raised on poultry and swine manure					
Mineral	Poultry	Swine	Proximate analysis	Poultry	Swine
P	1.51%	0.88%	Crude protein	42.1%	43.2
K	0.69%	1.16%	Ether extract	34.8	28.0
Ca	5.00%	5.36%	Crude fiber	7	--
Mg	0.39%	0.44%	Ash	14.6	16.6
Mn	246 ppm	348 ppm			
Fe	1370 ppm	776 ppm			
B	0 ppm	--			
Zn	108 ppm	271 ppm			
Sr	53 ppm	--			
Na	1325 ppm	1260 ppm			
Cu	6 ppm	26 ppm			
Al	97 ppm	--			
Ba	33 ppm	--			

Table 1. Minimum period (mean±SD) of the egg, larval and pupal stage and complete period (mean ± SD) of *Hermetia illucens* at constant temperatures and different diets (* indicate significant differences at $p < 0.05$ in each diet).

Diet	T° (°C)	Egg Stage (days)	Larval Stage (days)	Pupal Stage (days)	Life Cycle (days)
Hen Feed	25	3±0	34.56±0.51*	6.79±0.22	44.36±0.42*
	30	3±0	31.2±0.34	6.19±0.34	40.39±0.16
	35	2±0	20.12±0.39	8.42±1.66	30.54±1.70
Swine Meat	25	3±0	46.22±0.23*	7.84±0.25*	57.06±0.18*
	30	3±0	37.44±0.50	7.29±0.74	47.73±0.62
	35	2±0	26.3±0.55	8.36±0.27	36.66±0.58

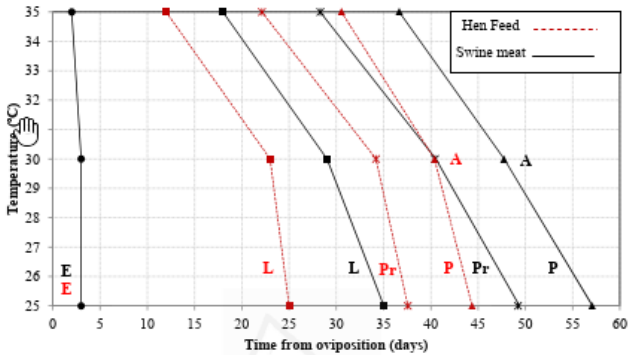


Figure 2. Isomorphic diagram of *Hermetia illucens* showing the different morphological stages: eggs (E), larval (L), prepupal (Pr), pupal (P) and adult (A), at 25, 30 and 35 ° C in swine meat (black) and hen feed (red).

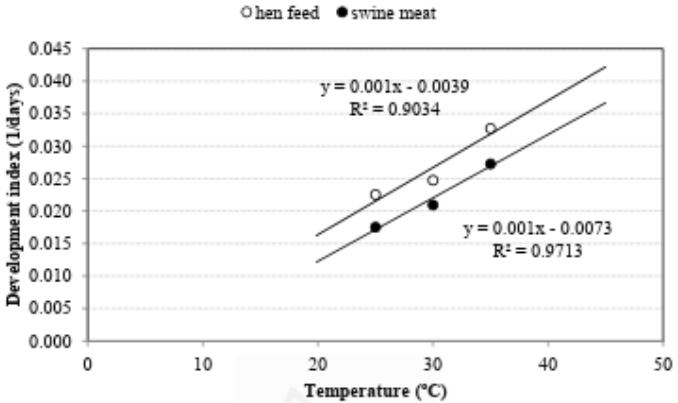


Figure 1. Relationship between the development index and development temperature of *Hermetia illucens* in hen feed and swine meat.

Fuente: Gobbi, 2012.

En función del sustrato alimenticio suministrado hay diferencias En tasas de desarrollo

Table 1. Compilation of animals as test objects and *H. illucens* as a form of feeding.

Animal	Form of *H. illucens*	Effects	References
		Positive influence	
Laying hens	Soybean meal and soybean oil + *H. illucens* pre-pupae	Increased egg weight by 1.1 times, increased SCFA concentration by 1.3 times	[32]
Laying hens	Corn-soybean meal + 25% of replaced protein by partially defatted *H. illucens*	Despite the reduced length of the intestinal villi, increased the amount of volatile fatty acids by 1.1 times and the amount of butyrate by 1.2 times in intestines	[33]
Hen broilers	Chicken feed + 5% or 10% of live *H. illucens* larvae	Decreased timidity of hens, increased activity of hens	[34]
Atlantic salmon (*Salmo salar*)	Corn protein, soybean meal + (200 $g \cdot kg^{-1}$) *H. illucens* meal	No significant differences to control	[36]
European seabass (*Dicentrarchus labrax*)	Fishmeal + 50% dried *H. illucens* larvae meal	No significant differences to control	[38]
Finishing pigs	Corn, wheat bran and soybean meal + 4% dried and crushed *H. illucens* prepupea	Decreased expression of pro-inflammatory cytokines and concentrations of total amines and phenol, increased expression of anti-inflammatory cytokines, intestinal barrier genes and concentrations of short-chain fatty acids (SCFA) and butyrate (prebiotic effect)	[39]
Weanling piglets	Fishmeal + 2% full-fat *H. illucens* larvae meal	Increased lactate in *illeum* by 1.6 times, in *cecum* by 2.2 times, and SCFA by 1.2 times in *illeum* and by 1.1 in *cecum* (probiotic effect), increased anti-inflammatory protein IL-10 by 1.3 times, decreased pro-inflammatory protein TNF-α by 1.3 times	[40]
Beagle dogs	Grain-based diet + 2% defatted *H. illucens* larvae meal	Improved dry matter digestibility by 1.1 times, decreased TNF-α levels by 1.8 times (anti-inflammatory effect), increased glutathione peroxidase levels by 1.23 times (antioxidant effect)	[41]
Rabbits	Rabbits feed + 1.5% *H. illucens* fat	Inhibition of the growth of the pathogens *Pasteurella multocida* by 3.2 times, *Yersinia enterocolitica* by 2.5 times, *Listeria monocytogenes* by 2.1 times	[43]
Muscovy ducklings (*Cairina moschata domestica*)	9% partially defatted *H. illucens* meal	Decrease in uric acid by 1.2 times and creatinine by 1.2 times (improved kidney function), increase in serum iron Fe by 1.3 times	[45]
African catfish (*Clarias gariepinus*)	Fishmeal + 50% partially defatted *H. illucens* larvae meal	Increase in body weight by 1.5 times	[47]
Rainbow trout (*Oncorhynchus mykiss*)	Control diet (wheat gluten, soybean meal and hemoglobin) + 15% *H. illucens* larvae meal	Increase in the number of beneficial *Lactobacillus* and *Bacillus* bacteria, reduction in *Aeromonas* pathogens in fish gut	[48]
Female turkeys	Soybean-maize enriched with 50 g/kg *H. illucens* larvae fat (50% and 100%)	Improved intestinal digestibility of the ether extract Increase in lipase activity Reduction of *Bacteroides-Prevotella* clusters	[50]
		Negative influence	
Meagre (*Argyrosomus regius*)	Partially defatted *H. illucens* + fishmeal	Weight loss, decrease in protein efficiency	[37]
Atlantic salmon (*Salmo salar*)	Control diet with full-fat *H. illucens* larvae meal, substituting 12.5% content of protein and control diet with full-fat *H. illucens* larvae paste, substituting 6.7% of protein	Decrease in protein and lipid efficiency and protein efficiency index, decrease in phosphorus retention	[49]

Fuente:
Kaczor, M.; Bulak, P.; Proc-Pietrycha, K.; Kirichenko-Babko, M.; Bieganowski, A The Variety of Applications of Hermetia illucens in Industrial and Agricultural Areas—Review. Biology 2023, 12, 25. https://doi.org/10.3390/ biology12010025

Primero: ¿Quien es la mosca?

- Insecto
- Orden Diptera: Dos alas, el otro par modificado a halterios (giroscopios)

Dos subórdenes=

- Nematocera (zancudos, mosquitos)= antenas largas

Culex sp.

- Brachycera (antenas cortas)= mosca de la casa, mosca de las frutas, la mosca soldado negra, moscas de importancia forense, veterinaria, control biológico

Toxotrypana curvicauda

https://www.cdc.gov/mosquitoes/es/about/life-cycles/culex.html

- Brachycera:

Familia Stratiomyidae

2700 especies, 380 géneros en el mundo

Moscas soldado: Región torácica pueden
Tener espinas o las larvas, simulando armaduras de guerra
Cretáceo temprano

Hermetia illucens, Linnaeus, 1758
Neotropical
Mosca de 16 mm de largo de cuerpo
En siglo 20, importancia alimenticia
En diferentes países se usa para producción de alimentos para animales (por el momento)

¿Por qué la mosca soldado negra?

Larvas son consumidoras voraces de materia orgánica en descomposición

- Residuos de cocina (uso en rellenos sanitarios)
- Residuos agroindustriales (cosecha o de animales)

Hermetia illucens y los desechos orgánicos

- A diferencia de otros insectos que consumen desechos,
- **NO** se considera un vector de enfermedades o una plaga.
- Rápida capacidad de procesar materia orgánico
- reduce los malos olores y
- el desarrollo de bacterias, incluida *Escherichia coli* (Hoc et al., 2019)

12 al 25% de biomasa sólida= larvas que pueden colectarse y ser usadas como fuente proteica en alimentación.

¿Mosca *vs* lombrices?

- Resistencia a amoniaco, alcoholes, pH y
- temperaturas

Ventajas adaptativas de las larvas de *H. illucens* (composición cuticular: hidrocarburos cuticulares,)

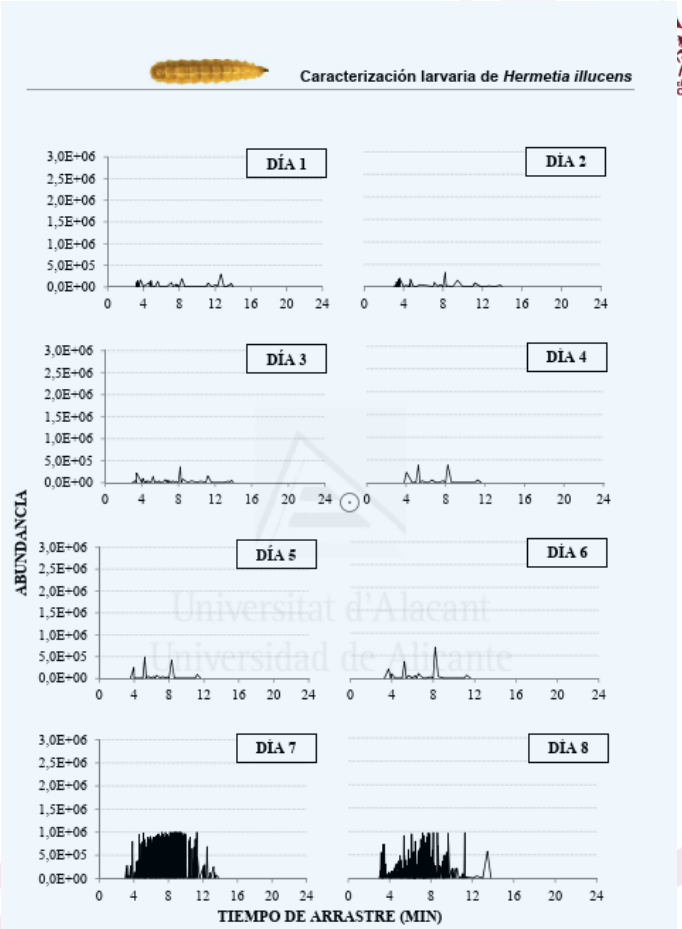


Figura 13. Cromatogramas (media) de los hidrocarburos cuticulares de larvas de *Hermetia illucens* muestreadas del día 1 al día 8.

Fuente: Gobbi, 2012.

Ventajas técnicas que la mosca soldado negro tiene:

- Insecto nativo (originario de América)
- Retenedores de nutrientes en su cuerpo: Proteínas, lípidos y carbohidratos (alto valor nutricional y comercial)
- Ciclo de vida corto
- Altas tasas de reproducción (> 500 huevos/hembra)
- Producción masiva, a nivel de biofábricas

Listo transformo la pulpa de café en abono, pero que hago con las moscas

- Fuente de alimentación=

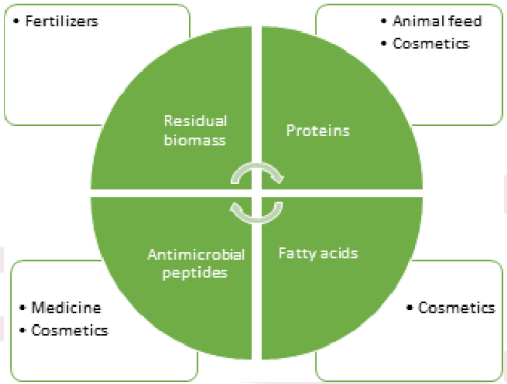
¿¿ Humanos ??

Animales

¿O que más puedo hacer?

Usos

- Pupas= extraer grasa para producción de biodiesel
- Larvas= alimento para animales domésticos, fuentes alternativas de proteína (futuro?)
- Quitina= nanofibrillas, agente floculante en tratamiento aguas, cicatrizante, espesante y estabilizador en alimentos y medicamentos, resina de intercambio iónico (farmacéutica, purificación de antibióticos, en otros), bioplásticos
- Grasas para cosmética.



Fuente: Kaczor, M.; Bulak, P.; Proc-Pietrycha, K.; Kirichenko-Babko, M.; Bieganowski, A. The Variety of Applications of Hermetia illucens in Industrial and Agricultural Areas—Review. Biology 2023, 12, 25. https://doi.org/10.3390/ biology12010025

Fotografía: Gobbi, 2012

- *Hermetia illucens* y el sector cafetero Colombiano

- Cenicafé

USO POTENCIAL DE *Hermetia illucens* (LINNAEUS) (DIPTERA: STRATYIOMIDAE) PARA TRANSFORMACIÓN DE PULPA DE CAFÉ: ASPECTOS BIOLÓGICOS

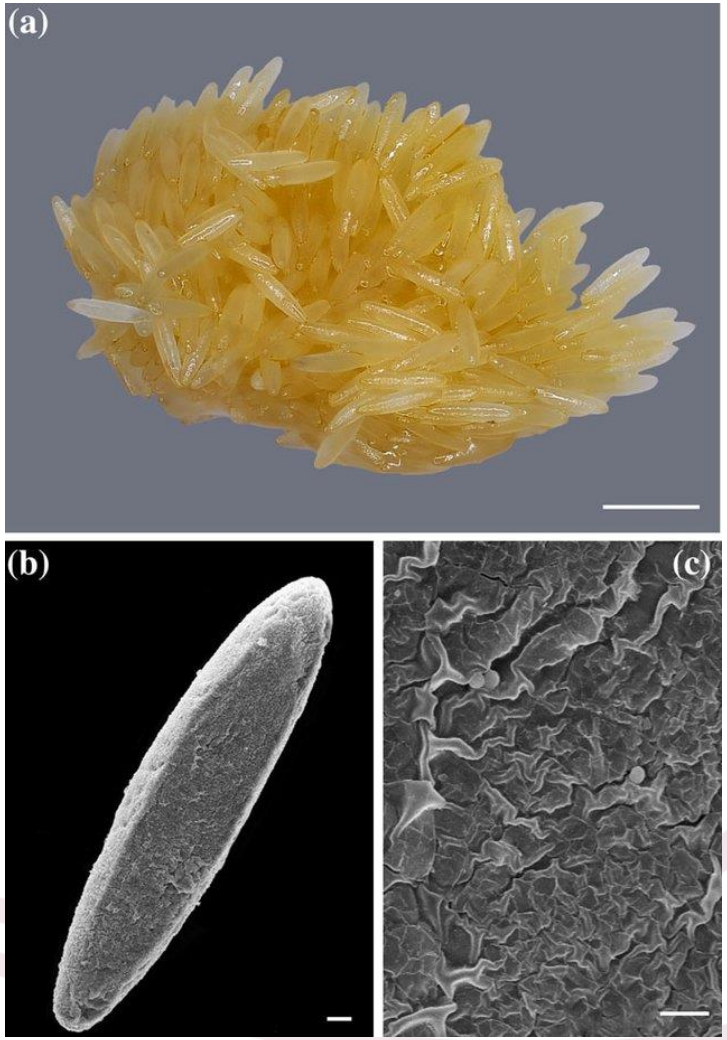
Marisol Giraldo Jaramillo*, Nelson Rodríguez Valencia**, Pablo Benavides Machado*

GIRALDO J., M.; RODRÍGUEZ V., N; BENAVIDES M., P. Uso potencial de *Hermetia illucens* (Linnaeus) (Diptera: Stratyiomidae) para transformación de pulpa de café: Aspectos biológicos. Revista Cenicafé 70(2):81-90. 2019

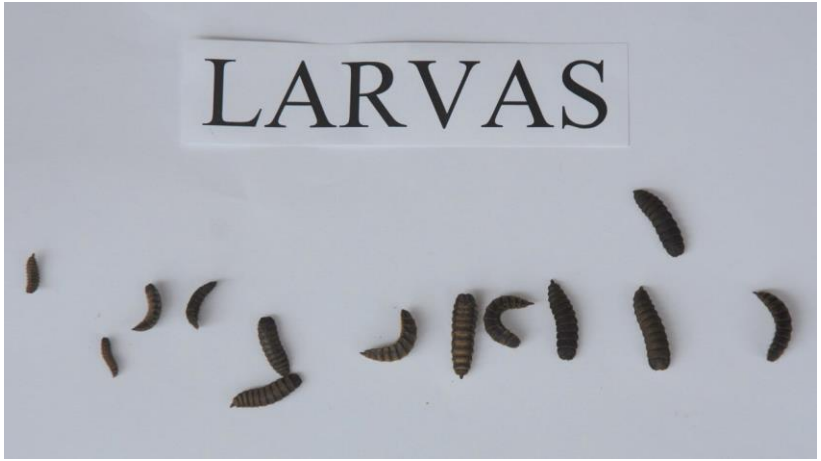
Conocimos a *Hermetia illucens*

- Una especie euriterma: Tolera temperaturas extremas y vivir en diferentes tipos de medio
- Polífagas: diversos productos orgánicos
- Gusano Phoenix = Conoce en el mercado
- Caracterización de duración de ciclo, tasas de supervivencia y longevidad de adultos
- Caracterización morfológico de los diferentes estados de desarrollo

Huevo
Altas tasa reproductivas

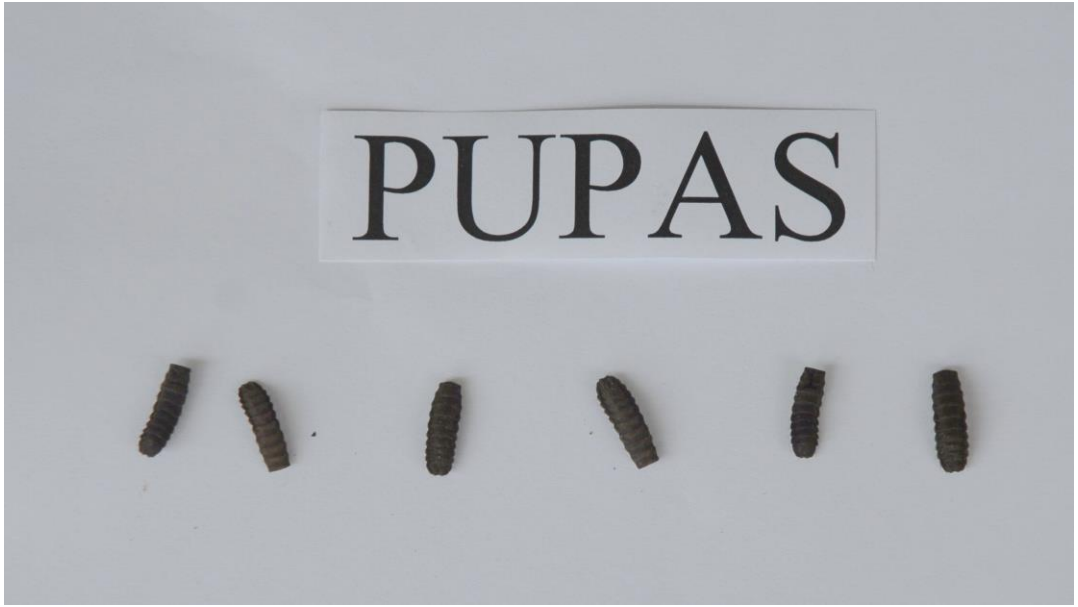


Fotografias: Barros y Rossi.



Fotografías: J.C. Ortiz, Rodríguez et al.

Pre-pupa



Fotografías: J.C. Ortiz

Hasta 2 cm.

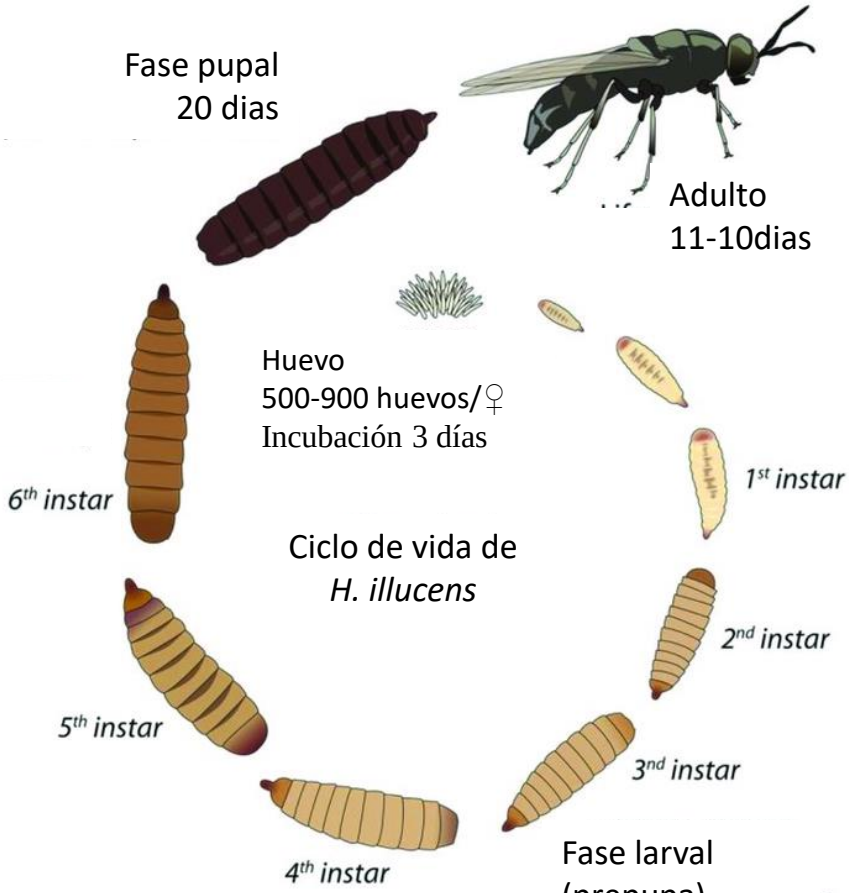
Fotografías: J.C. Ortiz

Aspectos biológicos de *H. illucens* en pulpa de café

Duración (días ± EE*) y viabilidad (%) de los diferentes estados biológicos *de Hermetia illucens* en pulpa de café en condiciones de laboratorio. Temperatura 25 ± 2 °C, humedad relativa de 80%±10% y fotoperíodo 12:12

Parámetro	Número de individuos (n)	Duración (días)	Viabilidad (%)
Período de incubación (días)	100	3,06±0,09	98
Período larval	98	22,83±0,17	85
Período pupal	84	19,92±0,17	95
Duración total (huevo-adulto)	84	45,75±0,24	-
Viabilidad total estados inmaduros	84	-	80
Hembras	45	10,54±0,72	
Machos	36	9,84±0,51	

Se comparo con datos de otros autores en sustratos como: maíz, alfalfa, salvado de Trigo
Diferencias en duraciones de fase larval



Fuente: Giraldo-Jaramillo et al., 2019

Conclusión

- *H. illucens* se desarrollo sobre pulpa de café, se abre la posibilidad para establecer las bases para proyectos de desarrollo tecnológico en la producción de insectos para alimentación de **ANIMALES** y transformación de pulpa de café en abono orgánico (Giraldo-Jaramillo et al., 2019)

Pero allí no acabo…

- Cenicafé (2013), Nelson Rodríguez y compañía, reportan:

CARACTERISTICAS FISCO QUIMICA DEL LARVICOMPUESTO DE PULPA DE CAFE

Compostaje tradicional

Tabla 9. Caracterización físico-química de la pulpa sola y mezclada con mucílago durante el proceso de compostaje. *Fuente: Blandón et al., 1998.*

Parámetro	Compostaje - Pulpa de café sola		Compostaje - Pulpa de café mezclada con mucílago	
	Sustrato inicial	Abono	Sustrato inicial	Abono
Humedad (%)	74,83	52,83	87,90	55,50
pH (unidades)	4,40	8,32	4,13	7,95
Cenizas (% bs)	6,66	45,56	7,30	20,65
Grasas (% bs)	1,60	0,27	2,00	0,31
Fibra (% bs)	11,43	26,48	17,16	24,85
N (% bs)	1,76	4,24	1,94	3,98
MO (% bs)	93,34	54,44	92,70	79,36
C/N	30,72	7,47	27,95	11,62
P (% bs)	0,13	0,27	0,13	0,25
K (%,bs)	2,82	5,27	2,75	4,10
Ca (% bs)	0,32	0,91	0,37	1,18
Mg (% bs)	0,08	0,19	0,11	0,26
Fe (mg kg^{-1}) (bs)	158,75	3.413,33	700,00	3.425,00
Mn (mg kg^{-1}) (bs)	69,00	155,17	43,00	169,25
Zn (mg kg^{-1}) (bs)	8,25	158,83	45,75	162,58
Cu (mg kg^{-1}) (bs)	9,75	14,67	17,75	40,42
B (mg kg^{-1}) (bs)	21,75	65,33	18,75	64,33

(% bs): Porcentaje en base seca

Larvicompuesto

Tabla 13. Caracterización físico-química del proceso de larvicompostaje de la pulpa sola y mezclada con aguas mieles.

Parámetro	Larvicompuesto de pulpa de café	Larvicompuesto de pulpa de café + aguas -mieles
Humedad (%)	73,67	78,33
pH (unidades)	8,22	7,53
Cenizas (% bs)	41,01	48,41
N (% bs)	3,77	4,05
MO (% bs)	58,99	51,59
C/N	9,08	7,39
P (% bs)	0,25	0,27
K (% bs)	6,71	5,31
Ca (% bs)	0,88	0,90
Mg (% bs)	0,27	0,23
Fe (mg kg^{-1}) (bs)	876,75	858,00
Mn (mg kg^{-1}) (bs)	129,78	141,12
Zn (mg kg^{-1}) (bs)	14,31	37,47
Cu (mg kg^{-1}) (bs)	31,82	83,22
B (mg kg^{-1}) (bs)	40,82	44,12

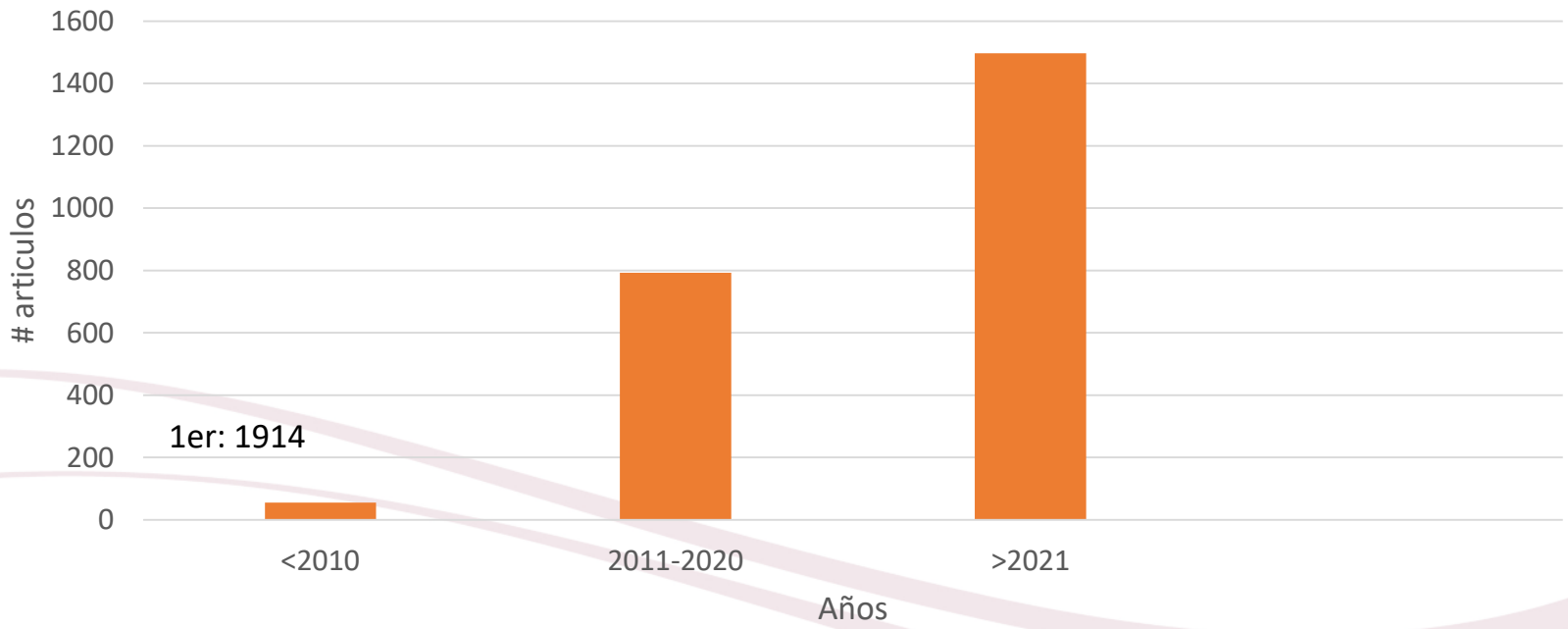
(% bs): Porcentaje en base seca

Fuente: Rodríguez-Valencia, N. 2023

Hermetia Illucens 4x #1 is a photograph by Javier Torrent - Vwpics which was uploaded on February 10th, 2017.

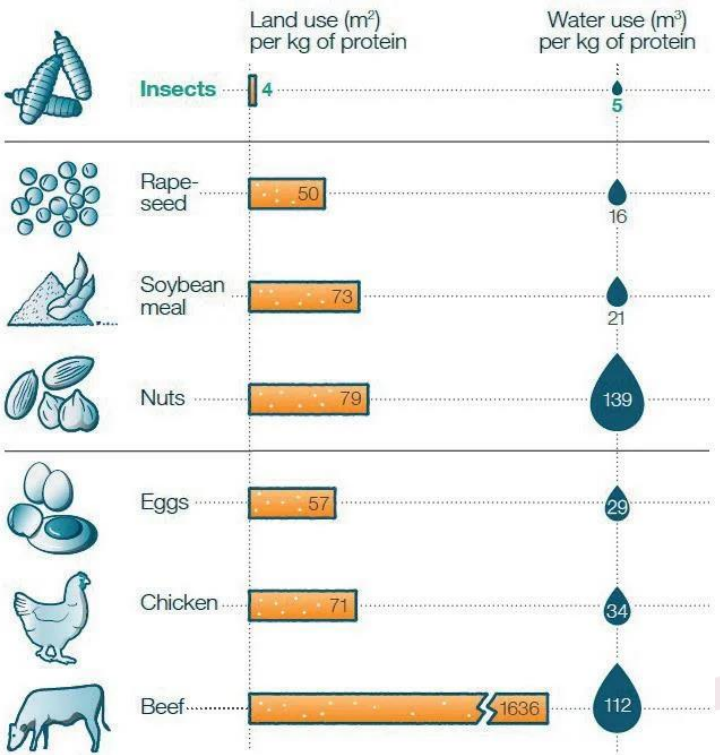
La mosca soldado negro HOY

Hermetia illucens – evolución (publicaciones)



Fuente: www.dimensions.ai

Uso de tierra y agua para producción



Fuente: IPIFF (international Platform of Insects for food and feed , UE - 2021.

biology

MDPI

Review

The Variety of Applications of *Hermetia illucens* in Industrial and Agricultural Areas—Review

Monika Kaczor [1], Piotr Bulak [1,*], Kinga Proc-Pietrycha [1], Marina Kirichenko-Babko [1,2] and Andrzej Bieganowski [1]

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Simple Summary: Human population growth contributes to a negative impact on the environment. In order to protect and restore nature, finding solutions and technologies in the industrial and agricultural fields that simultaneously recycle organic waste biomass, revalorize and recover nutrients and natural compounds is continuously important. The production of the insect *Hermetia illucens* (Diptera: Stratiomyidae, Linnaeus, 1758) fits well within the framework of green policy. *H. illucens* larvae fed on various biomass. The redirection of leftovers from fruit and vegetable or food processing to feed the larvae allows to produce insect proteins and fat, which can be further used in the production of animal feed. Besides, the larvae are also able to feed on manure, biogas sludge, and municipal sewage sludge, which decreases its weight and thus offers entomoremediation of the waste. Insect frass is use as an organic fertilizer. Fats and insect biomass are suitable for biodiesel production and biogas generation. From insect exoskeletons, chitin and chitosan are extracted. Thus, insect production seems to create new and unique opportunities for the environment, people, and animal nutrition, and the large and growing number of publications on *H. illucens* puts it in the center of interest of various research communities.

Citation: Kaczor, M.; Bulak, P.; Proc-Pietrycha, K.; Kirichenko-Babko, M.; Bieganowski, A. The Variety of Applications of *Hermetia illucens* in Industrial and Agricultural Areas—Review. *Biology* **2023**, *12*, 25. https://doi.org/10.3390/biology12010025

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Revised: 14 December 2022

Abstract: *Hermetia illucens* (Diptera: Stratiomyidae, Linnaeus, 1978), commonly known as the black soldier fly (BSF), is a saprophytic insect, which in recent years has attracted significant attention from both the scientific community and industry. The unrestrained appetite of the larvae, the ability to forage on various organic waste, and the rapid growth and low environmental impact of its breeding has made it one of the insect species bred on an industrial scale, in the hope of producing fodder or other ingredients for various animals. The variety of research related to this insect has shown that feed production is not the only benefit of its use. *H. illucens* has many features and properties that could be of interest from the point of view of many other industries. Biomass utilization, chitin and chitosan source, biogas, and biodiesel production, entomoremediation, the antimicrobial properties of its peptides, and the fertilizer potential of its wastes, are just some of its potential uses. This review brings together the work of four years of study into *H. illucens*. It summarizes the current state of knowledge and introduces the characteristics of this insect that may be helpful in managing its breeding, as well as its use in agro-industrial fields. Knowledge gaps and under-studied areas were

ARTICLE

BLACK SOLDIER FLY OIL: A PROMISING FUNCTIONAL INGREDIENT

Charles Rodde, PhD
R&D Manager
Entofood (Malaysia)

"The global vegetable oil production is located in only a few countries. This is a considerable concern for global food security as any destabilization of the global trade, or any obstacle to the production or export of these commodities, will lead to product shortage and soaring prices. In contrast, black soldier fly larvae can be farmed almost everywhere in the world, which is a strong asset for this oil to become a major ingredient for animal nutrition."

Black soldier fly farming is less than ten years old, but it has the potential to produce huge volumes of alternative insect-based products in the coming decades. Because insect oil is a major product of insect farming, it is critical to review its potential to support a healthy diet for animals.

The primary markets for insect products are the aquaculture, livestock and pet industries. Black soldier fly oil being a novel ingredient, two questions are frequently raised: what are the benefits compared to plant-based oil, and how does it contribute to animal nutrition and health?

GLOBAL VEGETABLE OIL PRODUCTION STATISTICS

During 2021-2022, the five most consumed vegetable oils in the world were, palm oil (71.2 million tons/year), soybean oil (59.3 million tons/year), rapeseed oil (29.4 million tons/year), sunflower oil (17.9 million tons/year) and palm kernel oil (8.3 million tons/year), respectively. Collectively, these five vegetable oils represented 91.1% of the world oil consumption (Statista, 2023).

Prices for these five oils have been extremely volatile over the last three years, increasing March 2020 (due to Covid-19 crisis) until reaching a peak in March 2022 (due to the war between Ukraine and Russia). From March to December 2022, the oil prices decreased, but without coming back to the initial values of March 2020 (Figure 1).

The majority of palm oil and palm kernel oil production is geographically circumscribed to Indonesia, Malaysia and Thailand, accounting for almost 90% of the global production. Similarly, 80% of the soybean production comes from Brazil, the United States of America and Argentina together. Regarding global sunflower production, Ukraine and Russia were the first and second highest producers in 2021 respectively, representing about 60% (US Department of Agriculture, 2023).

The global vegetable oil production is thus located in only a few countries. This is a considerable concern for global food security as any destabilization of the global trade, or any obstacle to the production or export of these commodities, will lead to prod-

European Journal of Lipid Science and Technology
Euro Fed Lipid

Short Communication | Open Access

Fractionation of Oil from Black Soldier Fly Larvae (*Hermetia illucens*)

André S. Bogevik, Tuulikki Seppänen-Laakso, Tor Andreas Samuelsen, Lars Thoresen

First published: 14 February 2022 | https://doi.org/10.1002/ejlt.202100252

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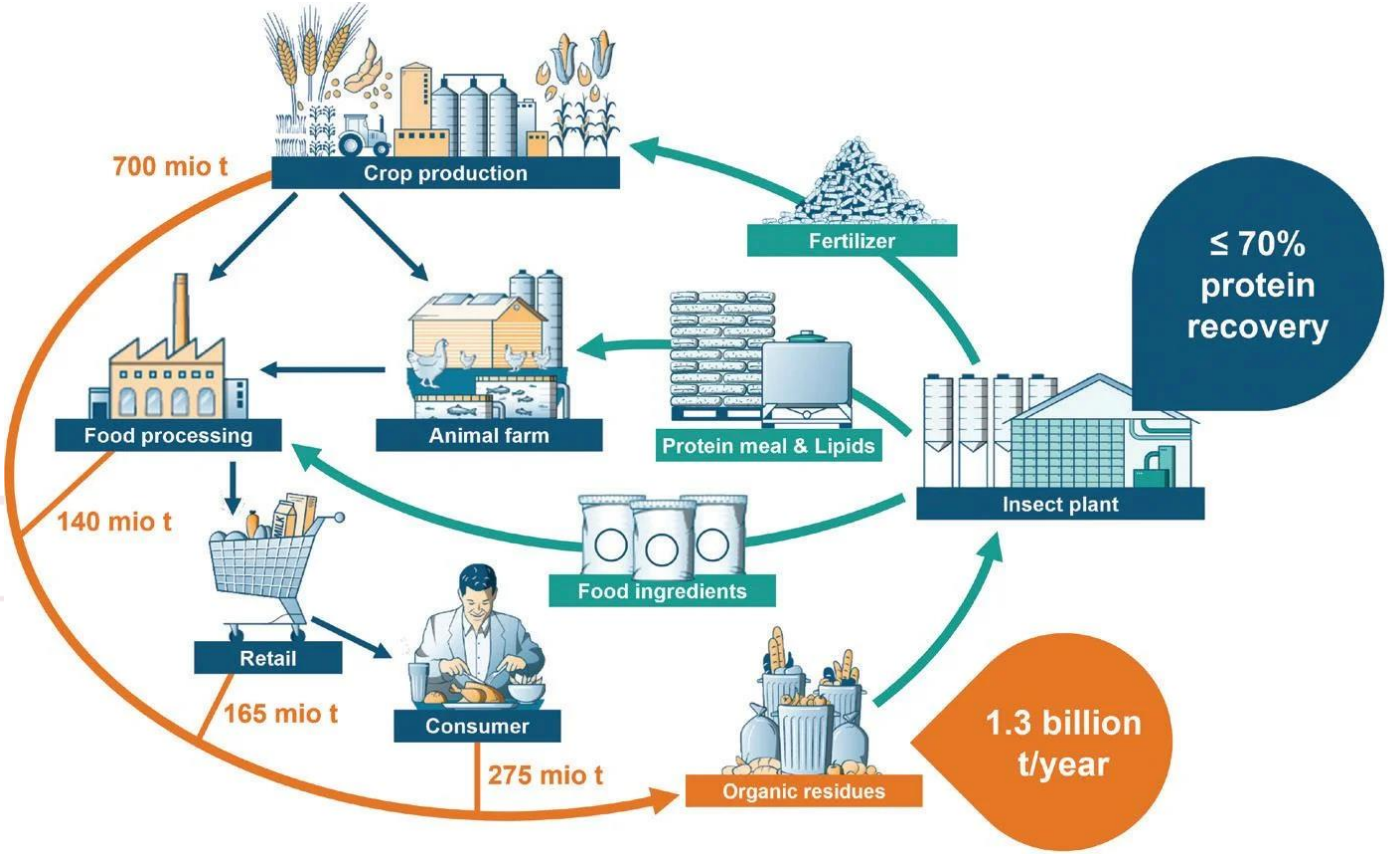
Abstract

Black soldier fly larvae (BSFL; *Hermetia illucens*) are subjected to a conventional fishmeal process, or room-temperature formic acid hydrolysis, and lipid yield and composition between the two processes compared. Acid hydrolysis of BSFL results in higher protein yield in the meal and higher oil yield. Oils separated after acid hydrolysis have a lower trilaurin content (triacylglycerol with lauric acid (12:0) in all *sn*-positions) and a lower melting point (23 °C) compared to oils separated after conventional (fishmeal) processing (26 °C). Further reduction of trilaurin content and melting point (20 °C) are achieved by dry-fractionation (winterization) of the oil.

En África se están utilizando las heces de *H. illucens* para generar Fuentes calóricas tipo carbones

Charcoal briquettes:
Es un tipo de **energía combustible sostenible elaborada a partir de materia prima de biomasa**.

Contribución de los insectos en la economía circular



TIPOS DE CRIA

Inputs

Organic substrates
A large variety of organic materials accumulate at various sites

Sourcing
Selected dry and wet feedstock arrive to the insect facility

Process

Feedstock preparation
The collected organic substrates are transformed into an optimal feed for the larvae

Rearing
With the right feed, the young larvae efficiently grow to their ideal harvesting weight

Insect breeding
A colony of selected beetles produces a consistent output of young larvae

Sist
dos

Larvae processing
The mature larvae are processed into safe products with consistent quality

Residue processing
Frass, skins and uneaten substrate can be sanitized, processed and packaged according to customer requirements.

Outputs

Whole insects
Cooked, frozen or dried. Suitable for applications such as meat patties and snacks.

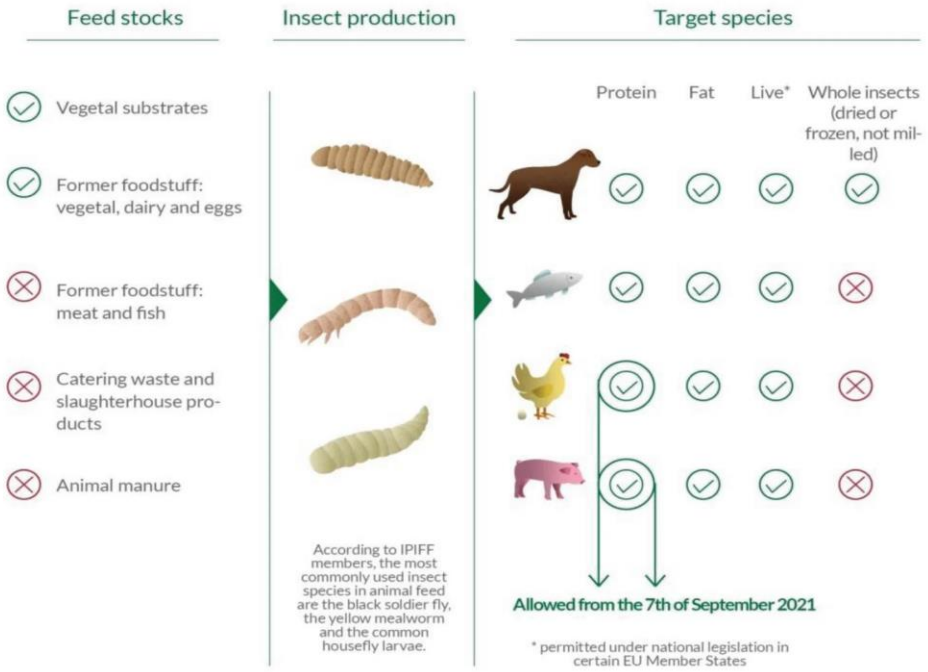
Insect flour
Suitable for applications such as cookies, pasta, and energy bars.

Fertilizer
The rearing residue has a high organic matter with many nutrients to improve soil fertility

Human nutrition
Insects are a sustainable, tasty and highly nutritious source of food

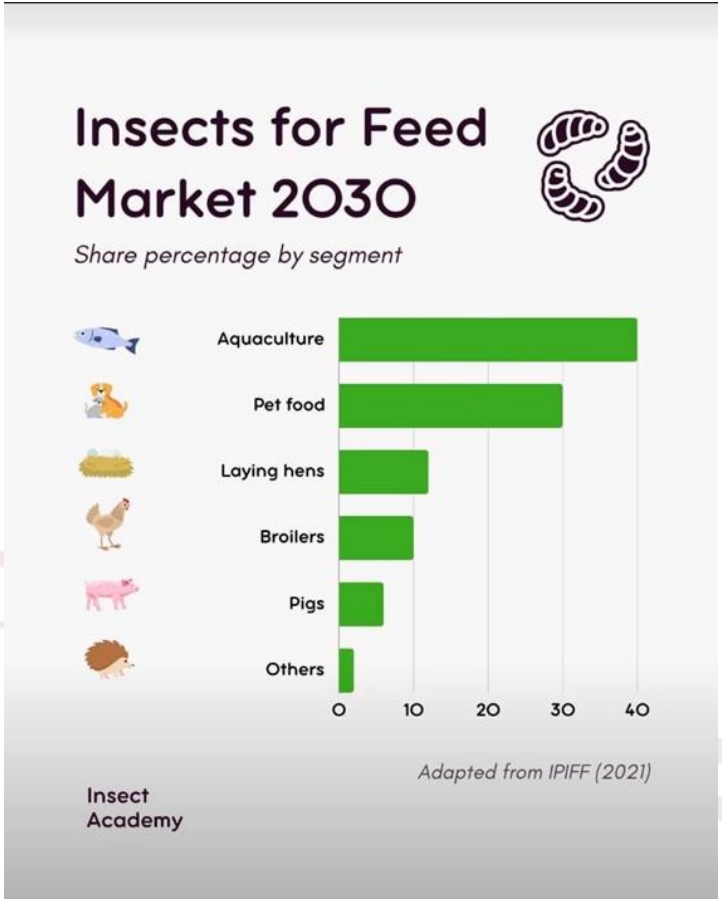
Plant nutrition
The fertilizer product can be applied as a soil amendment to stimulate plant growth

Proteínas obtenidas de los insectos se usan ahora en … perros, gatos, aves, reptiles, cerdos, animales exóticos (hurones)



Fuente: IPIFF (international Platform of Insects for food and feed , UE).

Proyecciones actuales de insectos para la alimentación en el mundo



Contribuer à la construction du système alimentaire durable de demain en développant une industrie pionnière et innovante

Au travers du développement de sa technologie et de ses produits, Innovafeed entend contribuer directement aux Objectifs de Développement Durable de l'ONU

L'insecte : une **nouvelle source de protéine** pour nourrir le monde de demain

Une filière circulaire et zéro-déchet pour **recycler plus de 300 000T de coproduits** agricoles par an

Chaque année sur notre usine, c'est **57 000T de CO_2 économisés**

1T de poisson nourri à l'insecte, c'est **250 kg de poissons fourrage préservés**

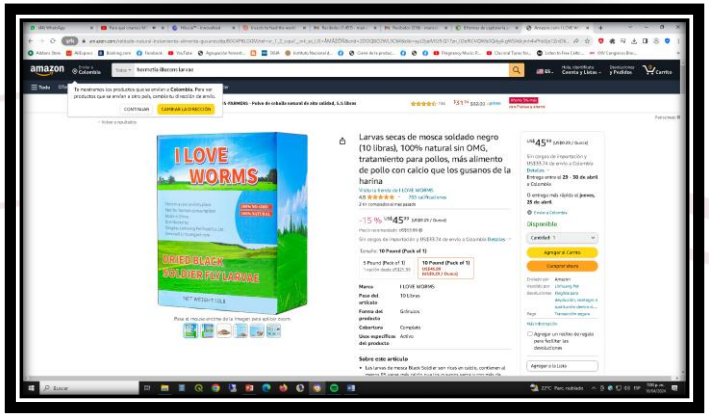
1T de volaille nourrie à l'insecte, c'est **210 m² de terres arables préservées**

Une solution naturelle et durable pour

EntoGreen to produce 25 tons of larvae per day with WEDA feeding system

19 January 2024

Feeding technology company WEDA has supplied a feeding system to Portuguese insect producer EntoGreen. The company will produce 25 tons of larvae per day from vegetable by-products with the new system.



Y Suramérica…

Sumitomo Corporation do Brasil S.A. Cyns Lambarin

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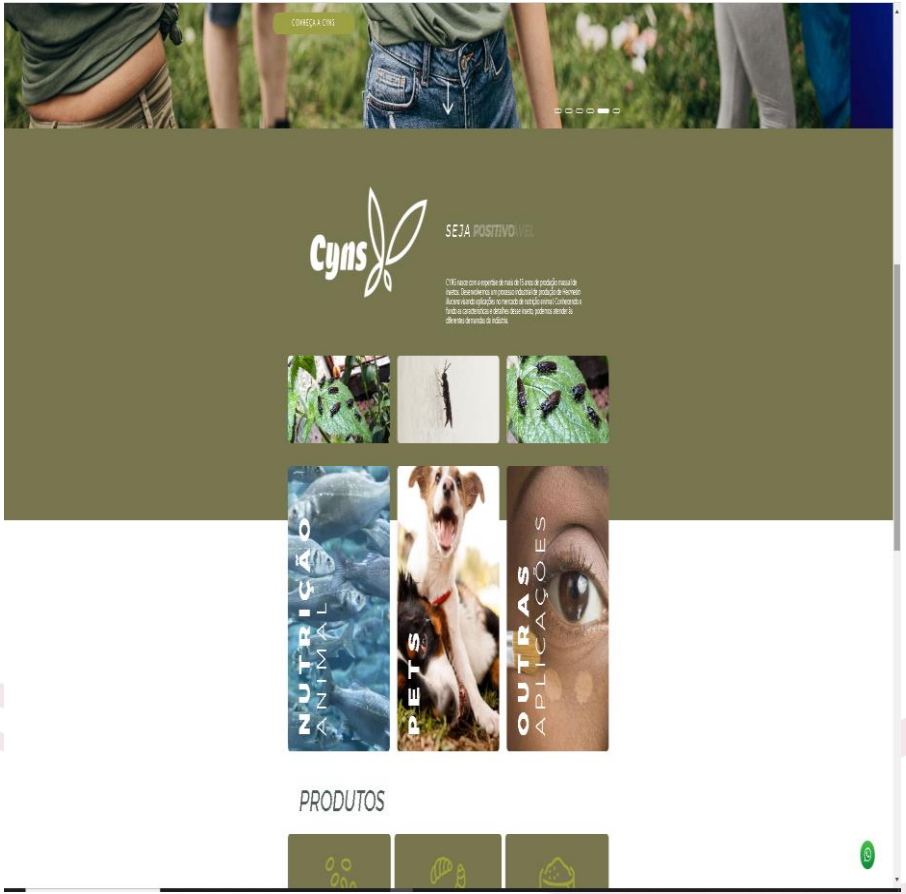
FOR IMMEDIATE RELEASE

Sumitomo Corporation makes investment in Brazilian insect protein production and biotechnology company Cyns to Support Next Generation Sustainable Feed Production

New York, NY – January 30, 2024 – Sumitomo Corporation, through Sumitomo Corporation do Brasil S.A. announced today a joint investment in a Seed round for Cyns, a biotechnology company located in Sao Paulo, Brazil, to unlock the next chapter of black soldier fly (BSF) farming in Latin America. Lambarin Investimentos, a Brazilian family office and wealth management firm, has also joined the Seed Funding Round together with Sumitomo.

Cyns is the leading biotechnology company specialized in sustainable insect-based animal nutrition in South America, having been the first company to obtain regulatory approval to produce and market black soldier fly-based ingredients for animal nutrition in Brazil.
The company is located in Piracicaba, Sao Paulo, the most prominent agtech valley in Brazil, and has developed a unique, cost-competitive horizontal BSF rearing system that delivers high bioconversion rates with minimum HVAC requirements by leveraging Brazil's naturally-suitable conditions for BSF rearing and large availability of sustainable food byproduct streams which are used as the source of nutrition for BSF larvae.

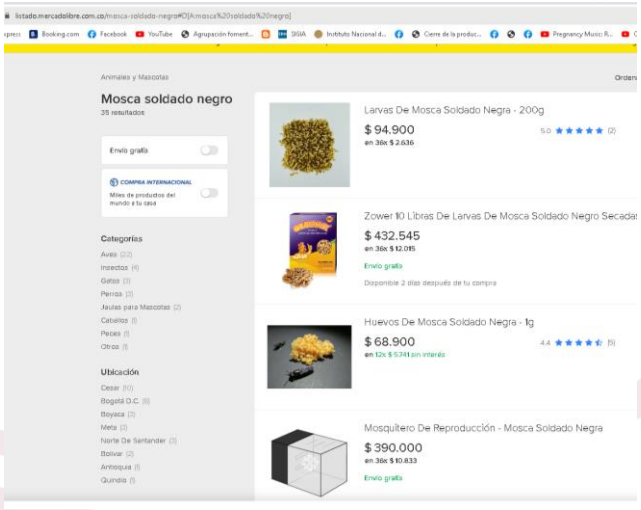
Cyns originated in 2015 as a project incubated by Bug Biological Agents, which was the pioneer in insect rearing for biological pest control in Latam. In 2020, it received its first angel investment from Lambarin Investimentos, and in 2022 Cyns opened Brazil's first BSF industrial pilot to receive regulatory approval. Since then, Cyns has successfully introduced its ingredients to the market, which can now be found in dog treats, bird and other exotic pet foods available in Brazil's largest pet retail outlets.



Colombia…

- Pilotos de alcaldias para manejo de rellenos sanitarios: p. ej Libano (Tolima)
- La UAntioquia – proyectos
- Univalle – cafeteros del valle
- Ucaldas – Oriente de Caldas
- Unisarc – Inicio de piloto
- Mercado
- (venta de larvas, huevos, aditamentos de cria)

- Y Cenicafé



Proyecciones con *H. illucens* en el sector cafetero colombiano…

POS106009

- Desarrollo de estrategias de manejo, tratamiento y valorización de biomasa residual generada en fincas cafeteras como medida de mitigación a la variabilidad climática.
- Líder: Nelson Rodríguez Valencia

Evaluación de sistemas de transformación de la biomasa residual en abono orgánico Mosca soldado negra

Continuará...

GRACIAS

Cenicafé

Federación Nacional de Cafeteros de Colombia

cenicafe@cafedecolombia.com

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