Black Soldier Fly rearing with artificial light: how to ensure mating success and fertile eggs

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Motivation

A frequent bottleneck in black soldier fly larvae (BSFL) biowaste processing is the production of sufficient amounts of eggs and larval offspring for biowaste treatment. To produce high number of eggs, black soldier flies (BSF) require certain qualities and quantities of light - ideally sunlight - for efficient mating, egg production, as well as egg oviposition. Because in temperate latitudes light quality and quantity may seasonally vary strongly, artificial light can be used to ensure year-around egg production. This factsheet provides some considerations for the selection of artificial lights based on experiences at the Eawag research facility in Switzerland.

Light quality

Not any lamp will do for efficient mating, egg production and oviposition by BSF. Different lamps emit light at different wavelengths. Blue (around 440 nm) and green (around 540 cm) light, and some ratio of it, shows to be especially important for mating success of BSF, and thereby egg production (Schneider, 2020). Specialized lamp manufacturers provide information on the light spectral. Both the SolarRaptor 70W spot lamp (Figure 1) and ExoTerra Natural light 26W emit green and blue light. However, based on our experience, only the use of the SolarRaptor lamp resulted in good mating and oviposition of eggs. When using onlyExoTerra Natural light 26W lamp, black soldier flies did not mate. When used in combination with the ExoTerra UVB100 26W, BSF mated and laid eggs but these were not fertile.

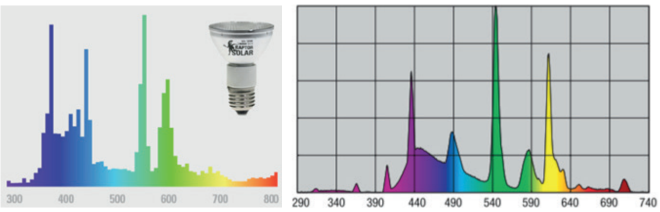

Figure 1: Light spectral composition of the SolarRaptor 70W spot lamp (left, ECONLUX GmbH) and the ExoTerra Natural light 26W lamp (right, Rolf C. Hagen Inc.). The x-axis shows the wavelength. The y axis the relative spectral power.

Light quantity

Besides light quality (i.e. spectral composition), BSF mating incidence, and thereby egg production, also correlates with the quantity of light provided (Schneider, 2020). In general, the light intensity is positively correlated with the power of the light source and negatively collected with distance between the light source and the love cage. As shown in Figure 2 for the SolarRaptor lamp, producers typically report the light power (in power/area, for example μW/m²). Reporting of illuminances (in Lux, symbol lx) is also common. The SolarRapor 70W spot lamp has a light power in the ultraviolet (UV) range of 210 μW/cm² and an illuminance similar to natural sunlight of around 127,000 lx at 60 cm distance from the light source. In comparison, the ExoTerra Natural light 26W had 10 μW/cm² (UVB range) and 510 lx, and the ExoTerra UVB100 26W had 80 μW/cm² (UVA and UVB range) and 200 lx.

Thus, lack of light amount may be one reason for lack of egg production and oviposition of infertile eggs when using the two ExoTerra lamps.

26W	Distance		UVA	Illuminance
	Inch	cm	μW/cm²	LUX
	4	10	500	15350
	8	20	135	3810
	12	30	60	1780
	16	40	25	1030
	20	50	20	690
	24	60	10	510
	28	70	7	370
	32	80	3	320
	36	90	1	250
	40	100	0	230

Figure 2: Light power of the SolarRaptor 70W spot lamp (left, ECONLUX GmbH) and the ExoTerra Natural light 26W lamp (right, Rolf C. Hagen Inc.)

Suppliers of artificial lights

Beyond the use for BSF rearing, such artificial lights are used for rearing of reptiles and growing of plants. Thus, these lamps can typically be found at pet stores and with suppliers of plant growing equipment. Furthemore, large e-tailers Amazon and Alibaba can also supply such artificial lights.

When purchasing such artificial lights, always consider the spectral composition (especially blue and green wavelength) and light illuminances (to match sunlight). Besides the SolarRaptor artificial lights, EVO Conversion Systems (www.evoconsys.com) supplies artificial lights found to be suitable for BSF egg production. EVO Conversion System lights (JM GREEN Black Soldier Fly Breeding LED 150W or 50W) are especially high in blue light and have around 3000-6000 lx, respectively.

References and further reading

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