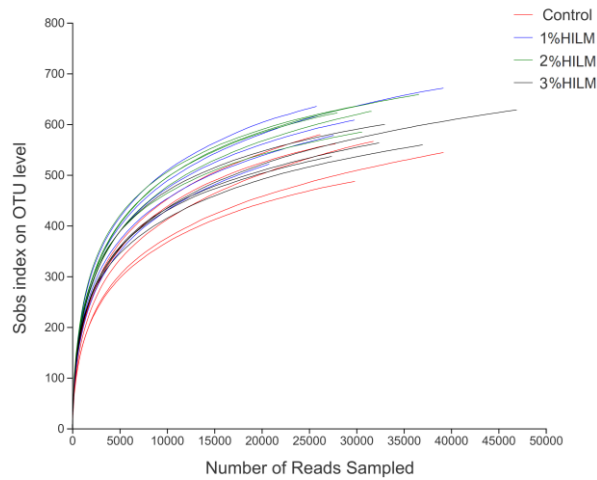


## Supplementary Materials:



**Figure S1.** Rarefaction curves. Abscissa represents the amount of sequencing data randomly selected; Ordinate represents observed species number (sobs index). Control:based deit; 1% HILM: based deit + 1% *Hermetia illucens* larvae meal group; 2 % HILM: based deit + 2% *Hermetia illucens* larvae meal group; 3% HILM: based deit + 3% *Hermetia illucens* larvae meal group.

**Table S1.** One-way ANOVA test data at the Phylum level /% \*.

Species Name	Control <sup>#</sup>	1% HILM <sup>#</sup>	2% HILM <sup>#</sup>	3% HILM <sup>#</sup>	p-Value
<i>Bacteroidetes</i>	76.460 ± 5.209 <sup>a</sup>	62.060 ± 1.716 <sup>b</sup>	53.880 ± 1.996 <sup>c</sup>	45.950 ± 2.636 <sup>d</sup>	<0.001
<i>Firmicutes</i>	19.420 ± 4.606 <sup>c</sup>	31.750 ± 1.852 <sup>b</sup>	41.910 ± 1.720 <sup>a</sup>	45.880 ± 2.632 <sup>a</sup>	<0.001
<i>Actinobacteria</i>	1.559 ± 0.649	3.190 ± 1.851	1.723 ± 0.823	3.708 ± 2.093	0.1626
<i>Proteobacteria</i>	0.343 ± 0.194	0.800 ± 0.560	0.814 ± 0.464	1.579 ± 1.980	0.1558
<i>Spirochaetes</i>	1.469 ± 1.125	0.285 ± 0.169	0.344 ± 0.152	0.605 ± 0.762	0.2306
<i>Patescibacteria</i>	0.163 ± 0.141	0.521 ± 0.437	0.150 ± 0.149	0.975 ± 1.172	0.2608
<i>Tenericutes</i>	0.177 ± 0.150	0.326 ± 0.126	0.524 ± 0.285	0.442 ± 0.304	0.1586
<i>Synergistetes</i>	0.087 ± 0.019	0.309 ± 0.158	0.109 ± 0.072	0.374 ± 0.553	0.0926
<i>Epsilonbacteraeota</i>	0.068 ± 0.026	0.181 ± 0.160	0.105 ± 0.070	0.299 ± 0.177	0.0910
<i>Deferribacteres</i>	0.082 ± 0.084	0.201 ± 0.129	0.177 ± 0.190	0.095 ± 0.084	0.3988
WPS-2	0.077 ± 0.094	0.089 ± 0.117	0.145 ± 0.201	0.052 ± 0.090	0.8326
<i>unclassified_k__norank_d__Bacteria</i>	0.034 ± 0.039	0.111 ± 0.211	0.032 ± 0.033	0.012 ± 0.009	0.4005
<i>Verrucomicrobia</i>	0.021 ± 0.040	0.089 ± 0.180	0.007 ± 0.007	0.010 ± 0.015	0.6911
<i>Elusimicrobia</i>	0.026 ± 0.038	0.029 ± 0.013	0.054 ± 0.062	0.012 ± 0.024	0.4924
<i>Cyanobacteria</i>	0.012 ± 0.008	0.046 ± 0.051	0.012 ± 0.012	0.009 ± 0.013	0.5744

\* This table shows the Phylum with average relative abundance in the top 15; datas were "Mean ± SEM";. # Control:based deit; 1% HILM: based deit + 1% *Hermetia illucens* larvae meal group; 2% HILM: based deit + 2% *Hermetia illucens* larvae meal group; 3% HILM: based deit + 3% *Hermetia illucens* larvae meal group. a, b, c. Means not sharing the same superscripts in a row differ significantly (  $p \leq 0.05$ ).

**Table S2.** One-way ANOVA test data at the Family level /% \*.

Species Name	Control <sup>†</sup>	1% HILM <sup>†</sup>	2% HILM <sup>†</sup>	3% HILM <sup>†</sup>	p-Value
<i>Rikenellaceae</i>	30.750 ± 8.415 <sup>a</sup>	24.830 ± 3.922 <sup>ab</sup>	24.750 ± 3.556 <sup>ab</sup>	17.170 ± 3.582 <sup>b</sup>	0.0195
<i>Bacteroidaceae</i>	33.070 ± 5.459 <sup>a</sup>	26.640 ± 4.033 <sup>ab</sup>	17.240 ± 1.189 <sup>cd</sup>	20.440 ± 5.213 <sup>bd</sup>	0.0010
<i>Ruminococcaceae</i>	8.257 ± 2.330 <sup>b</sup>	14.220 ± 3.103 <sup>ab</sup>	16.550 ± 3.909 <sup>a</sup>	20.190 ± 6.248 <sup>a</sup>	0.0054
<i>Lachnospiraceae</i>	7.521 ± 2.392 <sup>cd</sup>	11.230 ± 1.761 <sup>bc</sup>	15.830 ± 3.731 <sup>ab</sup>	17.890 ± 4.032 <sup>a</sup>	0.0043
<i>unclassified_o__Bacteroidales</i>	4.609 ± 2.170	4.093 ± 1.144	5.831 ± 2.009	3.077 ± 0.535	0.0696
<i>Prevotellaceae</i>	4.842 ± 1.066 <sup>a</sup>	2.274 ± 1.175 <sup>b</sup>	1.418 ± 0.767 <sup>b</sup>	1.534 ± 0.986 <sup>b</sup>	0.0025
<i>Atopobiaceae</i>	1.037 ± 0.509	2.303 ± 1.391	1.015 ± 0.649	1.977 ± 1.087	0.2046
<i>Tannerellaceae</i>	0.752 ± 0.401	1.586 ± 0.783	1.529 ± 0.722	0.944 ± 0.304	0.1655
<i>Peptococcaceae</i>	0.849 ± 0.447	1.225 ± 0.760	1.269 ± 0.372	0.998 ± 0.260	0.4690
<i>Erysipelotrichaceae</i>	0.424 ± 0.214 <sup>b</sup>	0.580 ± 0.329 <sup>b</sup>	1.851 ± 0.629 <sup>a</sup>	1.378 ± 0.460 <sup>a</sup>	0.0034
<i>Muribaculaceae</i>	0.901 ± 0.688	0.990 ± 0.450	1.257 ± 0.966	1.029 ± 1.103	0.9378
<i>Peptostreptococcaceae</i>	0.258 ± 0.326 <sup>cd</sup>	0.324 ± 0.288 <sup>cd</sup>	2.035 ± 1.057 <sup>ab</sup>	1.230 ± 0.877 <sup>bd</sup>	0.0280
<i>Christensenellaceae</i>	0.349 ± 0.128 <sup>c</sup>	0.726 ± 0.369 <sup>bc</sup>	1.268 ± 0.273 <sup>ab</sup>	1.312 ± 0.721 <sup>ab</sup>	0.0012
<i>Acidaminococcaceae</i>	0.867 ± 0.709	1.697 ± 1.786	0.287 ± 0.242	0.594 ± 0.616	0.2263
<i>Barnesiellaceae</i>	0.501 ± 0.396	0.815 ± 0.662	1.026 ± 0.590	1.015 ± 0.680	0.3918

\* This table shows the Family with average relative abundance in the top 15; datas were “Mean ± SEM”; # Control:based deit; 1% HILM: based deit + 1% *Hermetia illucens* larvae meal group; 2% HILM: based deit + 2% *Hermetia illucens* larvae meal group; 3% HILM: based deit + 3% *Hermetia illucens* larvae meal group. a, b, c Means not sharing the same superscripts in a row differ significantly ( $p \leq 0.05$ ).

**Table S3.** One-way ANOVA test data at the Genus level /% \*.

Species Name	Control <sup>†</sup>	1% HILM <sup>†</sup>	2% HILM <sup>†</sup>	3% HILM <sup>†</sup>	p-Value
<i>Bacteroides</i>	33.070 ± 5.459 <sup>ab</sup>	26.640 ± 4.033 <sup>bc</sup>	17.240 ± 1.189 <sup>d</sup>	20.440 ± 5.213 <sup>c</sup>	0.0010
<i>Rikenellaceae_RC9_gut_group</i>	29.070 ± 9.097 <sup>a</sup>	21.340 ± 4.238 <sup>a</sup>	20.730 ± 3.580 <sup>ab</sup>	11.370 ± 2.419 <sup>b</sup>	0.0016
<i>Ruminococcus_torques_group</i>	3.388 ± 1.029 <sup>cd</sup>	4.906 ± 2.187 <sup>bd</sup>	7.777 ± 2.185 <sup>ab</sup>	10.360 ± 2.792 <sup>a</sup>	0.0030
<i>unclassified_f_Lachnospiraceae</i>	2.229 ± 0.822 <sup>b</sup>	3.382 ± 0.779 <sup>ab</sup>	4.346 ± 1.486 <sup>a</sup>	4.781 ± 1.225 <sup>a</sup>	0.0235
<i>unclassified_f_Ruminococcaceae</i>	1.088 ± 0.126 <sup>b</sup>	2.106 ± 0.655 <sup>b</sup>	1.977 ± 0.544 <sup>b</sup>	3.402 ± 0.815 <sup>a</sup>	0.0013
<i>Shuttleworthia</i>	1.049 ± 0.574 <sup>ab</sup>	1.342 ± 0.597 <sup>ab</sup>	1.991 ± 0.697 <sup>a</sup>	0.690 ± 0.223 <sup>b</sup>	0.0233
<i>Prevotellaceae_UCG-001</i>	2.001 ± 0.618 <sup>a</sup>	1.085 ± 0.241 <sup>b</sup>	0.757 ± 0.371 <sup>b</sup>	0.627 ± 0.375 <sup>b</sup>	0.0172
<i>Romboutsia</i>	0.250 ± 0.319 <sup>b</sup>	0.285 ± 0.273 <sup>b</sup>	1.948 ± 1.039 <sup>a</sup>	1.204 ± 0.844 <sup>ab</sup>	0.0286
<i>Christensenellaceae_R-7_group</i>	0.337 ± 0.128 <sup>b</sup>	0.701 ± 0.354 <sup>ab</sup>	1.231 ± 0.271 <sup>a</sup>	1.279 ± 0.720 <sup>a</sup>	0.0014
<i>Ruminococcaceae_UCG-010</i>	0.322 ± 0.160 <sup>b</sup>	0.538 ± 0.266 <sup>b</sup>	1.406 ± 0.407 <sup>a</sup>	1.147 ± 0.244 <sup>a</sup>	0.0006
<i>norank_f_Clostridiales_vadinBB60_group</i>	0.409 ± 0.206 <sup>b</sup>	0.856 ± 0.128 <sup>ab</sup>	1.248 ± 0.547 <sup>a</sup>	0.639 ± 0.565 <sup>ab</sup>	0.0184
<i>Alloprevotella</i>	1.531 ± 0.939 <sup>a</sup>	0.158 ± 0.147 <sup>b</sup>	0.074 ± 0.038 <sup>b</sup>	0.287 ± 0.178 <sup>b</sup>	0.0276
<i>Ruminococcaceae_UCG-013</i>	0.209 ± 0.140 <sup>b</sup>	0.437 ± 0.311 <sup>ab</sup>	0.676 ± 0.208 <sup>a</sup>	0.268 ± 0.148 <sup>b</sup>	0.0214
<i>Turicibacter</i>	0.141 ± 0.129 <sup>b</sup>	0.081 ± 0.082 <sup>b</sup>	0.883 ± 0.368 <sup>a</sup>	0.404 ± 0.254 <sup>b</sup>	0.0083
<i>Lactobacillus</i>	0.108 ± 0.070	0.326 ± 0.311	0.296 ± 0.094	0.284 ± 0.180	0.0391
<i>norank_f_Ruminococcaceae</i>	0.087 ± 0.031 <sup>b</sup>	0.333 ± 0.215 <sup>a</sup>	0.187 ± 0.053 <sup>ab</sup>	0.387 ± 0.108 <sup>a</sup>	0.0017
<i>Sphaerochaeta</i>	0.402 ± 0.202 <sup>a</sup>	0.261 ± 0.178 <sup>ab</sup>	0.174 ± 0.112 <sup>ab</sup>	0.043 ± 0.028 <sup>b</sup>	0.0124
<i>Family_XIII_AD3011_group</i>	0.053 ± 0.019 <sup>b</sup>	0.108 ± 0.048 <sup>b</sup>	0.240 ± 0.108 <sup>a</sup>	0.166 ± 0.064 <sup>ab</sup>	0.0074
<i>unclassified_f_Prevotellaceae</i>	0.238 ± 0.091 <sup>a</sup>	0.152 ± 0.064 <sup>ab</sup>	0.079 ± 0.059 <sup>b</sup>	0.065 ± 0.053 <sup>b</sup>	0.0284
<i>unclassified_f_Eggerthellaceae</i>	0.035 ± 0.019	0.090 ± 0.014	0.073 ± 0.030	0.164 ± 0.144	0.0074
<i>Eubacterium_nodatum_group</i>	0.026 ± 0.012 <sup>b</sup>	0.052 ± 0.016 <sup>b</sup>	0.097 ± 0.032 <sup>a</sup>	0.108 ± 0.016 <sup>a</sup>	0.0001

\* This table shows the genus with significant difference ( $p \leq 0.05$ ) and abundance > 0.02%; datas were “Mean ± SEM”; <sup>†</sup> Control:based deit; 1% HILM: based deit + 1% *Hermetia illucens* larvae meal group; 2% HILM: based deit + 2% *Hermetia illucens* larvae meal group; 3% HILM: based deit + 3% *Hermetia illucens* larvae meal group. a, b, c Means not sharing the same superscripts in a row differ significantly ( $p \leq 0.05$ ).