

Supplementary material

Table S1.

Sequences of primers used for RT-qPCR.

Primers	Forward primer (5'–3')	Reverse primer (5'–3')	Reference
β -ACTIN	ACGTCGACATCCGCAAAGACCTC	TGATCTCCTTCTGCATCCGGTCA	[1]
SREBP-1C	GCTGTTGGCATCCTGCTATC	TAGCTGGAAGTGACGGTGGT	[2]
CYP7A1	GAGGGATTGAAGCACAAGAACC	ATGCCCAGAGAATAGCGAGGT	[3]
FAS	AGCCCCTCAAGTGCACAGTG	TGCCAATGTGTTTTCCCTGA	[3]
HMGCR	AGTGGTGCGTCTTCCTCG	CGAATCTGCTGGTGCTAT	[3]
LDLR	TGGCTATGAGTGCCTATGTCC	GGTGAAGAGCAGAAACCCTATG	[4]
FXR	CCGCAGTCGAGGCCATGTTCC	TCATCGGAGATGCCGCTCTTTCG	[5]
PPAR γ	CTGCGTCCCCGCCTTATTAT	GCTTCAATCGGATGGTTCTTCG	[6]
G6Pase	GAACGCCTTCTATGTCCTCTTT	GGTGACGGGGAAGTGTTCATC	[7]
GK	GCTTTTGAGACCCGTTTCGT	CGCACAATGTCGCAGTCG	[7]

References:

- 1 M. Zhang, Z. Xie, W. Gao, L. Pu, J. Wei and C. Guo, *Nutr. Res.*, 2016, **36**, 271–279.
- 2 Z. K. Zhou, F. Wang, X. C. Ren, Y. Wang and C. Blanchard, *Int. J. Biol. Macromol.*, 2015, **75**, 316–321.
- 3 Y. Ding, C. Xiao, Q. Wu, Y. Xie, X. Li, H. Hu and L. Li, *Front. Microbiol.*, 2016, **7**, 1–11.
- 4 M. Ichimura, M. Kawase, M. Masuzumi, M. Sakaki, Y. Nagata, K. Tanaka, K. Suruga, S. Tamaru, S. Kato, K. Tsuneyama and K. Omagari, *Hepatol. Res.*, 2015, **45**, 458–469.
- 5 L. Sheng, P. K. Jena, H. X. Liu, K. M. Kalanetra, F. J. Gonzalez, S. W. French, V. V. Krishnan, D. A. Mills and Y. J. Y. Wan, *Sci. Rep.*, 2017, **7**, 1–12.
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- 7 E. Abdel-Sattar, S. A. El-Maraghy, R. S. El-Dine and S. M. Rizk, *Chem. Biol. Interact.*, 2016, **252**, 47–53.

Table S2.

Effects of different *Monascus* pigments on HFD induced body and tissue weights.

Group	NFD	HFD	HFD+Y	HFD+R	HFD+O
Body weight (g)	298.44 ± 8.14 ^d	407.72 ± 8.84 ^a	313.48 ± 4.49 ^c	327.61 ± 9.37 ^c	370.16 ± 10.70 ^b
EAT weight (g)	5.04 ± 0.33 ^c	13.11 ± 0.37 ^a	8.06 ± 0.67 ^d	9.57 ± 0.23 ^c	10.50 ± 0.35 ^b
EAT (%BW)	1.69 ± 0.07 ^d	3.22 ± 0.12 ^a	2.57 ± 0.23 ^c	2.92 ± 0.10 ^b	2.84 ± 0.15 ^b
Liver weight (g)	9.25 ± 0.55 ^d	15.45 ± 0.49 ^a	10.01 ± 0.34 ^c	10.68 ± 0.31 ^c	12.84 ± 0.30 ^b
Liver weight (%BW)	3.10 ± 0.15 ^c	3.79 ± 0.17 ^a	3.19 ± 0.14 ^c	3.26 ± 0.17 ^{bc}	3.47 ± 0.14 ^b

Data are presented as the means ± S.D. Superscript letters in a row indicate significant different means at $P < 0.05$.

Table S3.

The hepatic injury scores from different treatment groups.

Definition	Score	NFD (n=8)	HFD (n=8)	HFD+Y (n=8)	HFD+R (n=8)	HFD+O (n=8)
< 5%	0	100%	0	75%	87.5%	87.5%
5%-33%	1	0	0	25%	12.5%	12.5%
> 33%-66%	2	0	62.5%	0	0	0
> 66%	3	0	37.5%	0	0	0

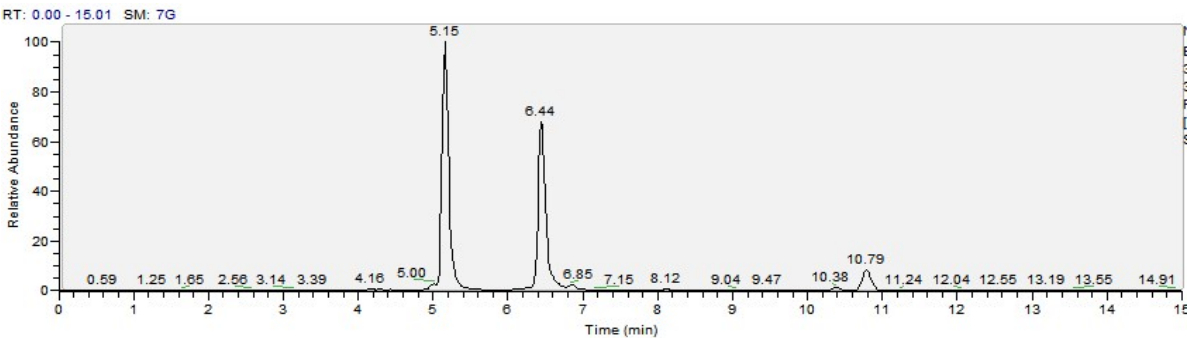
References:

- 1 D. E. Kleiner, E. M. Brunt, M. Van Natta, C. Behling, M. J. Contos, O. W. Cummings, L. D. Ferrell, Y. Liu, M. S. Torbenson, A. Unalp-arida, M. Yeh and A. J. McCullough, *Hepatology*, 2005, **41**, 1313–1321.
- 2 E. M. Brunt, B. A. Neuschwander-tetri, D. Oliver, K. R. Wehmeier and B. R. Bacon, *Hum. Pathol.*, 2004, **35**, 1070–1082.

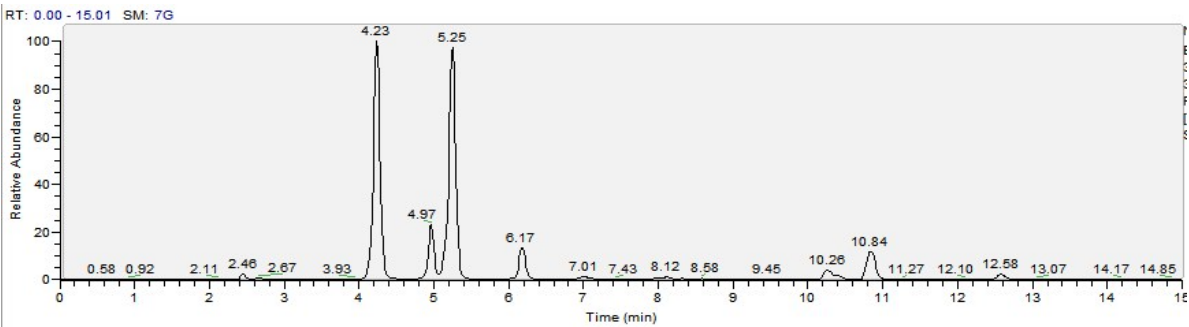
Figure S1.

UPLC chromatogram of the different *Monascus* pigments (yellow, red and orange pigments) extracted of red yeast rice.

Monascus yellow pigments



Monascus red pigments



Monascus orange pigments

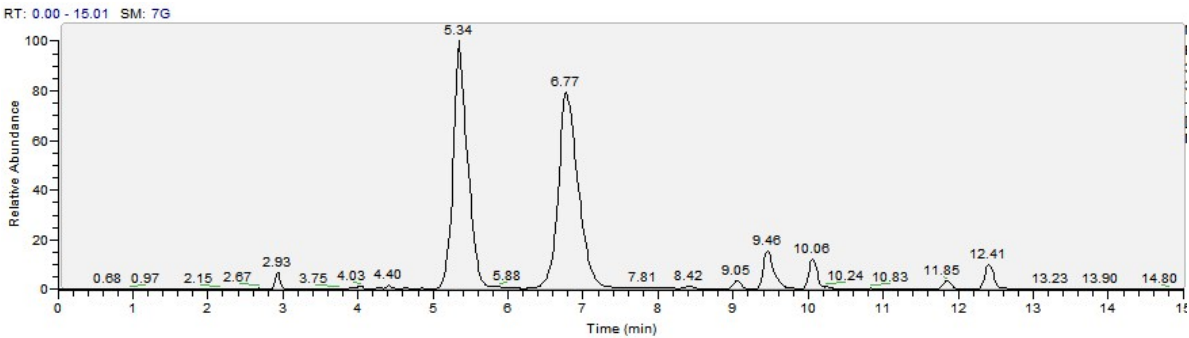
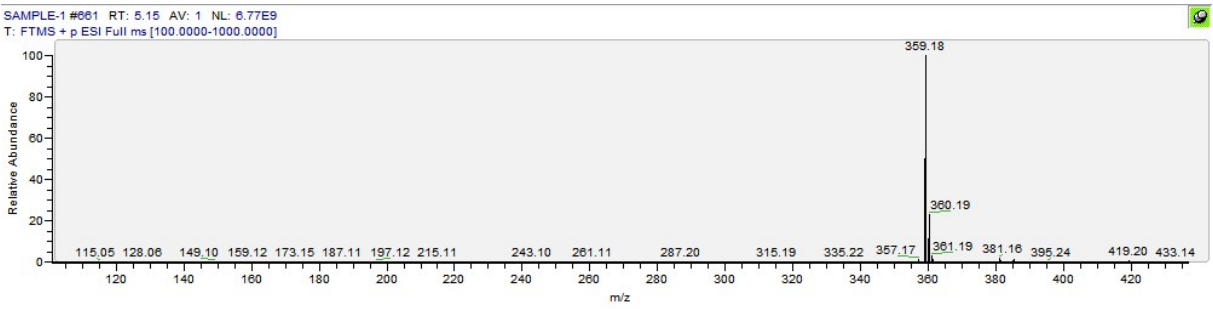


Figure S2.

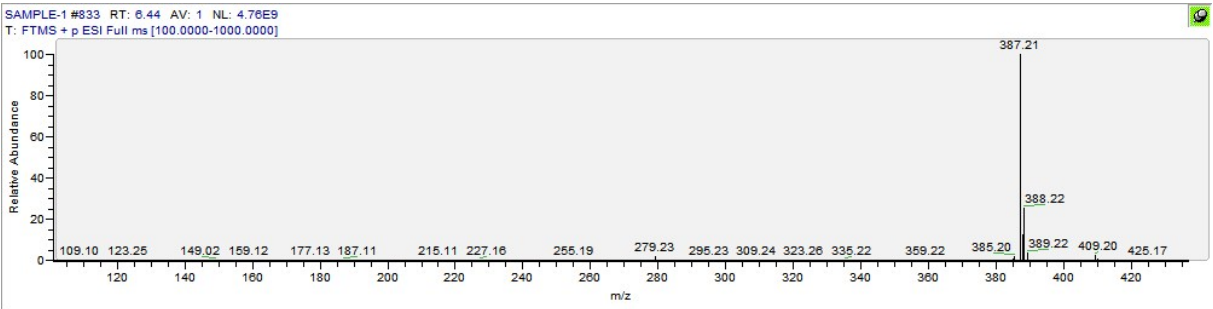
Mass spectra of MPs.

The main components of *Monascus* yellow pigments (the proportions of the main components in MYPs were preliminarily estimated according to the peak area of chromatography, the same below):

Monascin (56.48%)

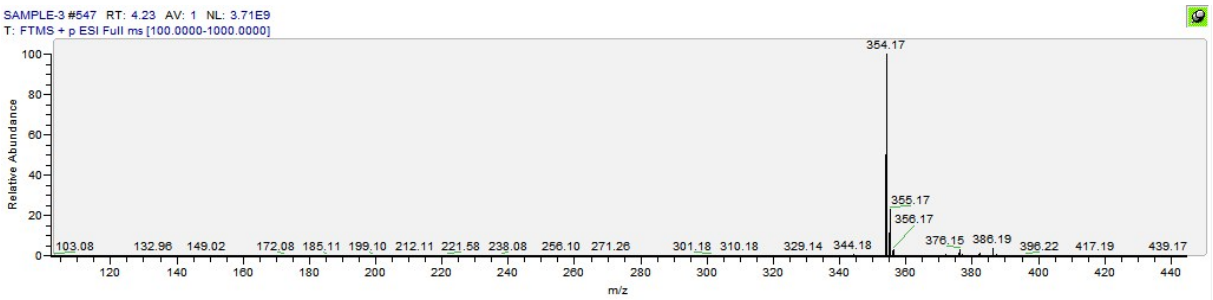


Ankaflavin (42.84%)

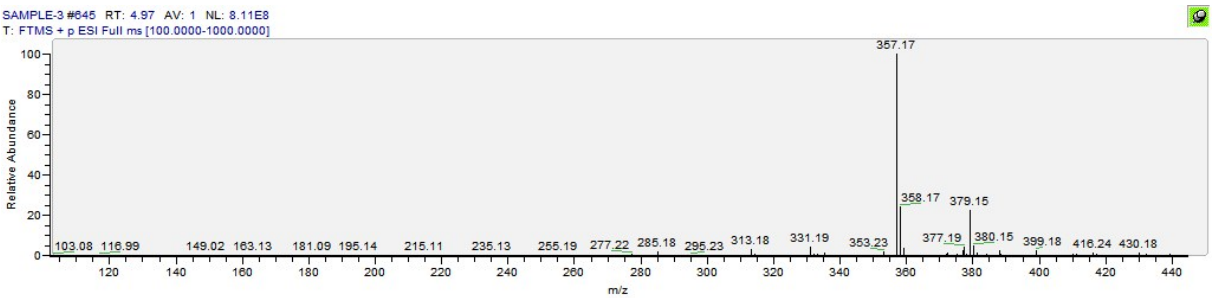


The main components of *Monascus* red pigments:

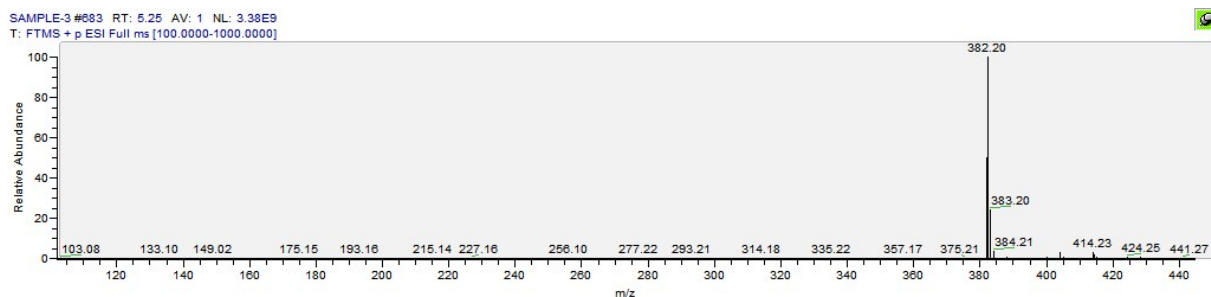
Rubropunctamine (37.55 %)



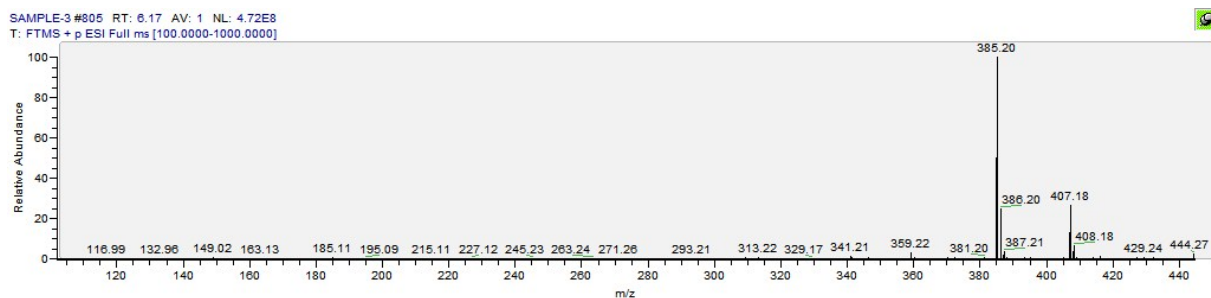
Monasfluore A (8.10%)



Monascorubramine (39.23%)

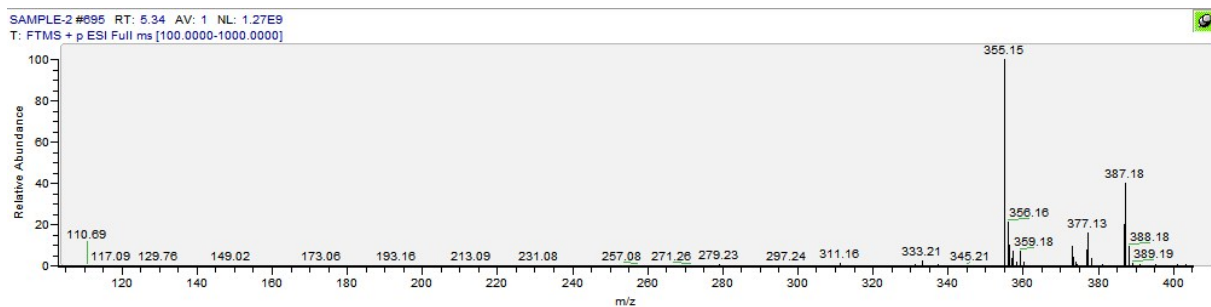


Monasfluore B (4.92%)



The main components of *Monascus* orange pigments:

Rubropunctatin (43.24%)



Monascorubrin (44.66%)

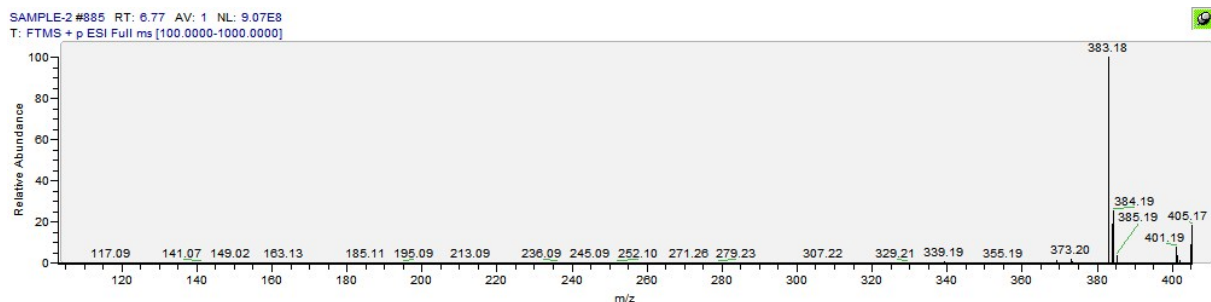


Figure. S3

Heatmap of Spearman's correlation between caecal microbiota of significant differences and lipid metabolic parameters. The intensity of the colour represents the degree of association between caecal microbiota and lipid metabolic parameters.

