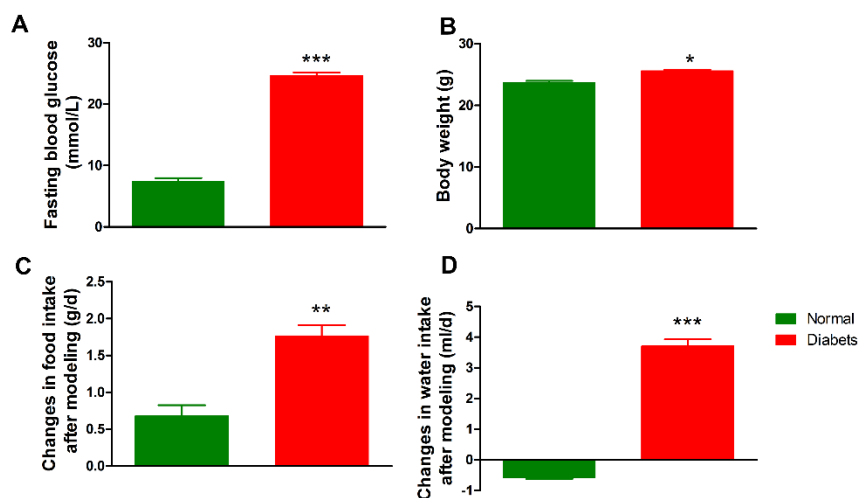
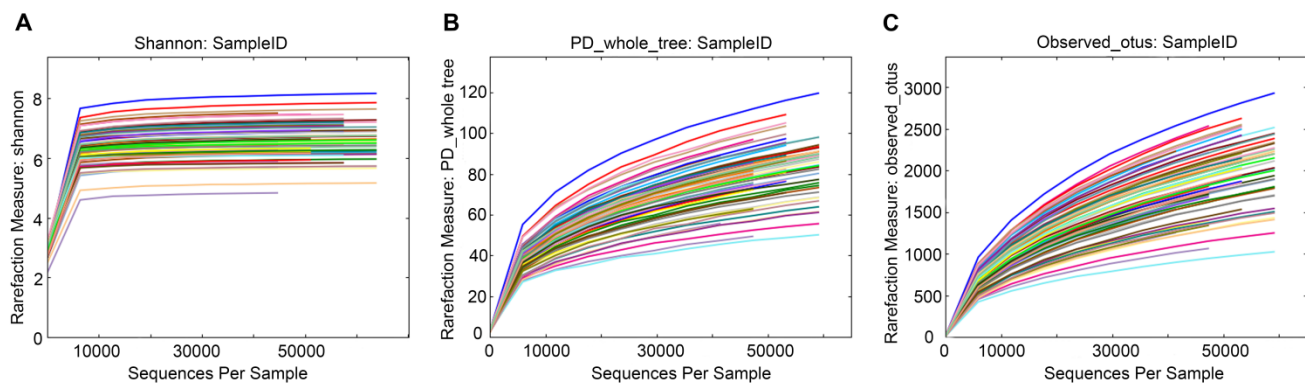


Supplemental Figures



Supplementary Figure 1. Mice treated with STZ intraperitoneal injection after 4 weeks high fat diet for diabetic model building. (A) Level of fasting blood glucose. (B) Body weight. (C) Changes in food intake. (D) Changes in water intake. Data are shown as mean \pm SEM. Differences between groups were statistically analyzed by t test, ** $p < 0.01$, *** $p < 0.001$ compared with normal group.



Supplementary Figure 2. Alpha diversity of gut microbial 16S rRNA genes. (A) Shannon index of all samples. (B) PD whole tree index of all samples. (C) Observed OTUs of all samples.

Supplemental Tables

Supplemental Table 1. Effect of treatments of MF, MOS and MF+MOS on water intake in C57BL/6J

mice (mean \pm SEM)

Group	0 week (mL/mice)	1 week (mL/mice)	2 weeks (mL/mice)	3 weeks (mL/mice)	4 weeks (mL/mice)	5 weeks (mL/mice)
NC	3.1 \pm 0.0	2.8 \pm 0.00	3.3 \pm 0.2	2.6 \pm 0.2	2.8 \pm 0.1	2.7 \pm 0.0
MC	6.4 \pm 0.9**	6.48 \pm 0.3**	7.6 \pm 0.6**	7.1 \pm 0.0***	6.6 \pm 0.4*	5.2 \pm 0.0**
MFH	6.6 \pm 0.0	7.2 \pm 0.2	7.4 \pm 0.4	6.0 \pm 0.5	5.4 \pm 0.6	3.2 \pm 0.26 [#]
MFL	7.5 \pm 1.8	7.9 \pm 0.3	8.2 \pm 0.2	7.3 \pm 0.5	6.0 \pm 0.8	4.0 \pm 0.2
MOSH	6.5 \pm 1.1	5.5 \pm 0.2	4.8 \pm 0.0 [#]	6.7 \pm 1.0	5.0 \pm 0.3	3.6 \pm 0.7
MOSM	6.3 \pm 0.4	5.7 \pm 0.7	5.5 \pm 0.1	6.0 \pm 0.8	5.2 \pm 0.3	4.7 \pm 0.0
MOSL	7.0 \pm 0.3	8.0 \pm 0.2	6.4 \pm 0.0	8.1 \pm 0.0	6.1 \pm 0.1	5.6 \pm 0.4
MFH+MOSH	6.7 \pm 0.6	3.8 \pm 0.1 ^{##}	3.3 \pm 0.4 ^{####++}	3.4 \pm 0.1 ^{##+}	3.9 \pm 0.5 [#]	2.4 \pm 0.3 ^{##}
MFH+MOSM	7.2 \pm 1.9	6.7 \pm 0.3	6.6 \pm 0.0	5.8 \pm 0.3	5.3 \pm 0.4	4.5 \pm 0.3
MFL+MOSH	6.2 \pm 0.6	5.5 \pm 0.8	4.0 \pm 1.1 ^{####++}	4.7 \pm 0.2 ^{##+}	4.3 \pm 0.3	2.4 \pm 0.8 ^{##}
MFL+MOSM	6.7 \pm 1.2	6.9 \pm 0.2	6.4 \pm 0.3	5.7 \pm 0.5	4.5 \pm 1.3	3.9 \pm 0.2

Data were analyzed using one-way ANOVA followed by Tukey's post hoc test. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ compared with normal control group (NC); [#] $p < 0.05$, ^{##} $p < 0.01$, ^{###} $p < 0.001$ compared with diabetic model group (MC); ⁺ $p < 0.05$, ⁺⁺ $p < 0.01$, ⁺⁺⁺ $p < 0.001$ MF+MOS group compared with MF group with the same dosage.

Supplemental Table 2. Effect of treatments of MF, MOS and MF+MOS on food intake in C57BL/6J mice (mean \pm SEM)

Group	0 week (g)	1 week (g)	2 weeks (g)	3 weeks (g)	4 weeks (g)	5 weeks (g)
NC	2.6 \pm 0.2	2.7 \pm 0.0	2.6 \pm 0.0	2.5 \pm 0.0	2.4 \pm 0.4	2.3 \pm 0.0
MC	2.4 \pm 0.1	2.2 \pm 0.1	2.5 \pm 0.0	2.6 \pm 0.2	2.6 \pm 0.2	2.0 \pm 0.1
MFH	2.5 \pm 0.1	2.8 \pm 0.1	2.5 \pm 0.1	2.4 \pm 0.0	2.4 \pm 0.1	2.1 \pm 0.4
MFL	2.8 \pm 0.2	2.8 \pm 0.3	2.8 \pm 0.0	2.8 \pm 0.1	2.3 \pm 0.3	2.0 \pm 0.3
MOSH	2.5 \pm 0.1	2.0 \pm 0.1	2.3 \pm 0.2	2.9 \pm 0.1	2.7 \pm 0.1	2.2 \pm 0.2
MOSM	2.5 \pm 0.1	2.4 \pm 0.0	2.5 \pm 0.2	2.6 \pm 0.1	2.5 \pm 0.1	2.1 \pm 0.1
MOSL	2.5 \pm 0.0	2.6 \pm 0.0	2.3 \pm 0.0	2.9 \pm 0.0	2.4 \pm 0.0	2.1 \pm 0.1
MFH+MOSH	2.4 \pm 0.0	2.2 \pm 0.0	2.4 \pm 0.0	2.2 \pm 0.0	2.5 \pm 0.2	2.0 \pm 0.0
MFH+MOSM	2.4 \pm 0.1	2.5 \pm 0.1	2.6 \pm 0.0	2.6 \pm 0.2	2.6 \pm 0.2	2.1 \pm 0.0
MFL+MOSH	2.4 \pm 0.2	2.4 \pm 0.1	2.2 \pm 0.0	2.3 \pm 0.0	2.4 \pm 0.0	1.8 \pm 0.2
MFL+MOSM	2.2 \pm 0.0	2.6 \pm 0.1	2.4 \pm 0.2	2.4 \pm 0.2	2.1 \pm 0.3	1.8 \pm 0.2

Data were analyzed using one-way ANOVA followed by Tukey's post hoc test.

Supplemental Table 3. Effect of treatments of MF, MOS and MF+MOS on body weight in C57BL/6Jmice (mean \pm SEM)

Group	0 week (g)	1 week (g)	2 weeks (g)	3 weeks (g)	4 weeks (g)	5 weeks (g)
NC	23.7 \pm 0.8	23.9 \pm 0.8	24.2 \pm 0.7	24.0 \pm 0.2	23.8 \pm 0.2	24.8 \pm 0.3
MC	25.9 \pm 1.8 [*]	26.0 \pm 1.6 [*]	26.7 \pm 1.6 [*]	26.3 \pm 0.6 [*]	26.7 \pm 0.6 ^{**}	27.2 \pm 0.8 [*]
MFH	24.9 \pm 1.2	24.5 \pm 0.9	24.9 \pm 0.9	24.8 \pm 0.4	25.2 \pm 0.5	25.1 \pm 0.4
MFL	27.9 \pm 1.5	27.7 \pm 1.8	28.4 \pm 1.6	28.5 \pm 0.7	28.5 \pm 0.6	28.8 \pm 0.6
MOSH	25.2 \pm 1.8	25.0 \pm 1.5	25.5 \pm 1.7	25.4 \pm 0.8	26.3 \pm 0.8	26.9 \pm 1.1
MOSM	25.5 \pm 1.2	25.6 \pm 1.1	25.6 \pm 0.9	25.8 \pm 0.4	26.1 \pm 0.4	26.8 \pm 0.4
MOSL	25.6 \pm 1.4	26.0 \pm 1.2	26.4 \pm 1.3	26.2 \pm 0.5	26.3 \pm 0.5	27.0 \pm 0.5
MFH+MOSH	25.8 \pm 0.6	25.8 \pm 0.5	25.7 \pm 0.8	25.5 \pm 0.3	26.1 \pm 0.3	26.4 \pm 0.4
MFH+MOSM	26.0 \pm 1.4	26.1 \pm 1.2	25.9 \pm 1.3	26.4 \pm 0.5	26.4 \pm 0.6	26.4 \pm 0.6
MFL+MOSH	24.7 \pm 1.1 ⁺⁺	25.0 \pm 1.0 ⁺⁺	25.0 \pm 1.1 ⁺⁺	25.1 \pm 0.4 ⁺⁺⁺	25.5 \pm 0.3 ⁺⁺	25.2 \pm 0.4 ⁺⁺⁺
MFL+MOSM	24.5 \pm 0.9 ⁺⁺⁺	24.6 \pm 0.9 ⁺⁺⁺	24.2 \pm 1.9 ^{#+++}	24.7 \pm 0.4 ⁺⁺⁺	24.8 \pm 0.3 ⁺⁺⁺	24.8 \pm 0.5 ⁺⁺⁺

Data were analyzed using one-way ANOVA followed by Tukey's post hoc test. ^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0.001$ compared with normal control group (NC); [#] $p < 0.05$, ^{##} $p < 0.01$, ^{###} $p < 0.001$ compared with diabetic model group (MC); ⁺ $p < 0.05$, ⁺⁺ $p < 0.01$, ⁺⁺⁺ $p < 0.001$ MF+MOS group compared with MF group with the same dosage.

Supplemental Table 4. Effect of treatments of MF, MOS and MF+MOS on FBG in C57BL/6J mice (mean \pm SEM)

Group	0 week (mmol/L)	1 week (mmol/L)	2 weeks (mmol/L)	3 weeks (mmol/L)	4 weeks (mmol/L)	5 weeks (mmol/L)
NC	7.5 \pm 0.5	8.9 \pm 0.9	9.4 \pm 0.2	8.7 \pm 0.4	8.3 \pm 0.4	9.9 \pm 0.2
MC	25.4 \pm 1.6 ^{***}	25.8 \pm 2.0 ^{***}	27.6 \pm 1.6 ^{***}	27.2 \pm 1.9 ^{***}	26.1 \pm 0.7 ^{***}	26.4 \pm 1.7 ^{***}
MFH	29.6 \pm 1.1	26.2 \pm 1.2	27.2 \pm 0.7	23.9 \pm 2.4	22.0 \pm 2.8	19.9 \pm 2.8
MFL	25.8 \pm 1.0	27.0 \pm 0.8	28.7 \pm 0.7	29.8 \pm 1.4	28.0 \pm 1.7	26.8 \pm 1.7
MOSH	24.9 \pm 1.9	21.1 \pm 1.7	23.4 \pm 2.9	23.5 \pm 1.7	20.4 \pm 2.5	19.2 \pm 3.8
MOSM	24.3 \pm 1.0	23.9 \pm 0.9	25.7 \pm 1.7	26.6 \pm 1.5	21.4 \pm 0.9	23.5 \pm 1.2
MOSL	23.7 \pm 1.0	24.6 \pm 1.2	28.2 \pm 0.4	29.6 \pm 1.4	26.9 \pm 0.7	28.6 \pm 0.8
MFH+MOSH	24.6 \pm 0.7	23.4 \pm 2.0	23.1 \pm 1.8	17.8 \pm 2.8 [#]	15.9 \pm 1.9 [#]	13.2 \pm 1.8 ^{##}
MFH+MOSM	22.9 \pm 2.2	24.1 \pm 1.0	23.8 \pm 2.3	24.4 \pm 2.1	21.1 \pm 2.8	16.0 \pm 3.0 [#]
MFL+MOSH	21.7 \pm 1.4	24.8 \pm 1.5	23.7 \pm 1.2	22.5 \pm 2.0	18.3 \pm 1.9	12.4 \pm 2.3 ^{###}
MFL+MOSM	23.7 \pm 2.2	25.1 \pm 1.6	24.13 \pm 1.8	23.7 \pm 1.6	21.5 \pm 2.5	17.6 \pm 2.5

Data were analyzed using one-way ANOVA followed by Tukey's post hoc test. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ compared with normal control group (NC); # $p < 0.05$, ## $p < 0.01$, ### $p < 0.001$ compared with diabetic model group (MC); ⁺ $p < 0.05$, ⁺⁺ $p < 0.01$, ⁺⁺⁺ $p < 0.001$ MF+MOS group compared with MF group with the same dosage.

Supplemental Table 5. Oral glucose tolerance test results in the last week of administration

Group	0 min (mmol/L)	30 min (mmol/L)	60 min (mmol/L)	120 min (mmol/L)
NC	11.1±0.9	14.4±1.2	10.3±0.4	8.0±0.5
MC	17.5±1.5	31.8±0.9 ^{***}	31.0±1.1 ^{***}	27.7±1.0 ^{***}
MFH	12.8±1.9	28.0±2.9	26.3±2.6	21.0±3.1
MFL	12.7±2.9	26.1±3.4	24.6±2.8	20.1±3.2
MOSH	12.6±1.5	26.0±1.9	23.6±1.6	19.3±2.0
MOSM	10.8±1.1	28.7±1.8	24.0±1.7	21.1±2.2
MOSL	14.9±2.2	30.2±1.4	30.0±1.1	26.7±0.7
MFH+MOSH	9.2±1.5	21.9±2.5	20.1±3.5 [#]	13.3±3.1 ^{##}
MFH+MOSM	10.0±1.7	21.5±1.1	21.8±2	16.3±2.2 [#]
MFL+MOSH	12.3±0.8	27.1±1.1	25.8±1.8	18.9±1.2
MFL+MOSM	10.0±2.8	24.3±3.1	23.7±3.3	18.4±3.1

Supplemental Table 6. Effect of treatments of MF, MOS and MF+MOS on biochemical parameters in C57BL/6J mice (mean \pm SEM)

Group	HbA1c (Absorbance/10 g hemoglobin)	HOMA-IR
NC	38.5 \pm 1.5	38.2 \pm 1.5
MC	85.4 \pm 3.9 ^{***}	112.3 \pm 13.6 ^{***}
MFH	69.8 \pm 2.8	79 \pm 12.1
MFL	85.0 \pm 3.8	95.9 \pm 9.0
MOSH	69.1 \pm 2.3	78.5 \pm 19.8
MOSM	75.6 \pm 4.3	99.2 \pm 5.8
MOSL	86.4 \pm 4.6	106.3 \pm 9.4
MFH+MOSH	47.9 \pm 2.6 ^{###}	44.7 \pm 5.4 ^{###}
MFH+MOSM	64.7 \pm 2.8 [#]	52.8 \pm 10.9 ^{##}
MFL+MOSH	69.6 \pm 4.8	37.6 \pm 5.7 ^{###}
MFL+MOSM	78.5 \pm 4.6	70.4 \pm 7.8