

[Academic information]. Sun Chlorella Corporation R&D department

Water extract of chlorella and Phenethylamine a functional ingredient in Chlorella significantly mitigated high fat diet (HFD) induced liver damage.

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【Research objective】 :

Previously Sun Chlorella had identified phenethylamine (PHA) which is classified as monoamine in the hot water extract of chlorella pyrenoidosa(WEC) as functional factor that expands the life span of superoxide dismutase-1 gene(Sod1) mutant adult of *Drosophila melanogaster*. However, the biological activity of trace amounts of PHA has not been examined in mammals. We continued our collaboration with Kyoto University aiming to elucidate the mechanism of action with PHA.WEC related on mitigation of high- fat diet induced hepatic damages rats model with non-alcoholic fatty liver disease(NAFLD), in which oxidize of lipids accumulated in the liver by consuming a high- fat diet leads to disease progression.

The article can be viewed freely. For more details, check the article. ([Link](#))

[Test methods]

NAFLD model mice fed a 60% high-fat diet were orally administered chlorella water extract at 100 mg/kg (WEC group) or phenethylamine at 10 µg/kg (PHA group) for 12 weeks. Evaluations included biochemical tests in the blood and molecular biology tests in the liver, and the results were compared with mice kept on normal diet (ND group) and 60% high-fat diet (HFD group) only. Significant variation was assessed at $p < 0.05$.

[Results]

Biochemical tests

AST and ALT, which are indicators of liver damage, were significantly lower in the WEC and PHA groups than in the HFD group, indicating an inhibition of elevation in the PHA group. In addition, LDL-cholesterol was significantly suppressed in the WEC and PHA groups, which was comparable to that in the ND group. (Figure 1)

Molecular biology test

Oxidation of lipids in the liver produced malondialdehyde (MDA), an indicator of oxidative stress and highly cytotoxic, inhibited the increase in the WEC and PHA groups compared with the HFD group, showing values comparable to those in the ND group. Therefore, methylglyoxal (MGO), which promotes MDA oxidize and is cytotoxic, was

measured from lipids and showed a significant decrease in the WEC and PHA groups. Accordingly, we measured the levels of glyceraldehyde-3 phosphate dehydrogenase (GAPDH), which may reduce the levels of precursors of MGO and maintain the antioxidant capacity of fatty liver, and found that the HFD group had a greater reduction compared with the ND group, whereas the WEC and PHA groups had a reversal. (Figure 2)

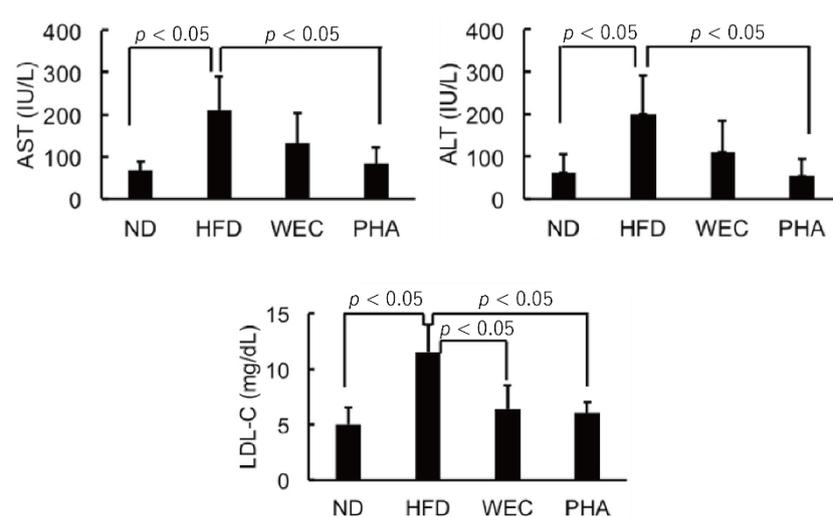


Figure 1 Biochemical tests

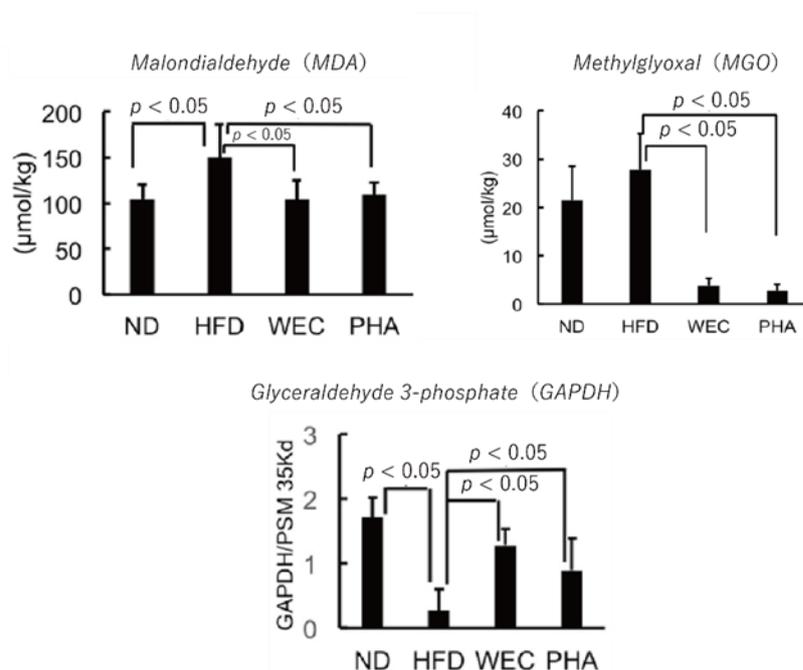


Figure 2 Molecular biology

Thus, "Chlorella aqueous extract or phenethylamine restores GAPDH level and consequently inhibits the production of MGOs and MDAs in liver injury induced by high-fat diet" was elucidated as the mechanism of action.

Details

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Author: Yifeng Zheng¹⁾, Agustin Martin-Morales¹⁾, Jing Wang¹⁾, Masaki Fujishima²⁾, Eri Okumura²⁾ & Kenji Sato¹⁾

Affiliation: 1) Division of Applied Biosciences, Graduate School of Agriculture, Kyoto University 2) Sun Chlorella Corp.

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