

The Effect of Dietary *Phoenix dactylifera* on Gut Microbial Composition and Memory in *Drosophila melanogaster* Expressing the Amyloid Precursor Protein (APP)

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This study aimed to investigate the impact of *Phoenix dactylifera* (dates) on the progression of Alzheimer's disease (AD) in *Drosophila melanogaster*. AD is a prevalent neurodegenerative disorder that causes memory loss. It is hypothesized that incorporating dates into the diet of genetically modified *Drosophila* (fruit flies) expressing the amyloid precursor protein (APP) would alleviate memory loss. The experimental design involved two tests. The first utilized four groups: wild-type and three APP-modified groups with 0%, 2%, and 4% date concentration diets. A T-maze with olfactory learning assessed the flies' memory retention, associating a positive reinforcement with a banana odor and a negative reinforcement with an electrical shock. Flies with the 4% date concentration had a P-value of .95 when compared to wild-type, showing adequate memory performance. The second part of the experiment separated flies into two wild-type groups, receiving 4% and 0% dietary date concentrations, and two APP-modified groups receiving 4% and 0% dietary date concentrations. Upon DNA extraction from midguts, PCR, and sequencing, the results showed that flies with AD 0% date had significantly more Proteobacteria, a phylum of bacteria that induce neuroinflammation. For the AD group with 4% date, the relative abundance of Proteobacteria decreased and the relative abundance of Firmicutes increased, a phylum of bacteria that reduces neuroinflammation. This shows that dates have a positive effect on the gut microbiome, and this could be what makes them beneficial for lowering the expression of AD.

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