A University of California, Riverside research team published a study that will likely make insect studies of greater health or agricultural importance possible.

The team explored how individual neurons in each taste organ act to control feeding in fruit flies.

The fruit fly has multiple taste organs throughout its body to detect chemicals, called tastants, that signal whether a food is palatable or harmful.

"Insect feeding behavior directly impacts humans in many ways, from disease-carrying mosquitos that seek human blood to pests whose appetite can wreak havoc on the agricultural sector," associate professor and leader of the study, Anupama Dahanukar said.

"How insect taste neurons are organized and how they function is critical for a deeper understanding of their feeding behavior."

Dahanukar's team used the fly pharynx as a model to study whether taste information regulates sugar and amino acid consumption at the cellular level.

She explained animals rely heavily on the sense of taste to make feeding decisions, such as consuming nutritive foods while avoiding toxic ones.

In mammals, taste information is determined by specialized cells in the taste buds of the tongue that can detect different chemicals.

Several new studies in flies indicate individual taste neurons can detect compounds belonging to more than one taste category, raising some questions about the distinct behavioral roles of individual taste neurons.

"If many classes of taste neurons are activated by sugar, for example, how does activation of just one class of taste neurons affect behavior?"

Dahanukar's team answered this question by genetically engineering a fly in which only a single defined class of pharyngeal neurons is active.

"We found single-taste neurons are capable of responding and activating behavioral responses to more than one tastant category -- sweet and amino acids in our study," Yu-Chieh David Chen, the first author of the research paper said.

"Altogether, our results argue for the existence of a combinatorial coding system, wherein multiple neurons coordinate the response to any given tastant," Dahanukar said.

Rather than encoding tastes as in mammals, flies appear to encode some combination of valence -- attractive versus aversive -- and tastant identity, she said.

The researchers found food choice decisions cannot be made in the absence of taste input; the latter is critical for ensuring appropriate food choice and feeding behavior.

Dahanukar acknowledged that her lab has only evaluated a single taste neuron within the system it set up, with many more remaining to be studied.