How one pest adapted to life in the dark

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A type of beetle that lives its entire life burrowing through stored grain has been found to lack full colour vision, and what's more the vision it does have breaks the rules. Most other insects have trichromatic vision – they are sensitive to ultraviolet, blue and long wavelength light. In a report published in the online open access journal *Frontiers in Zoology*, scientists reveal that this beetle has lost photoreceptors that are sensitive to blue wavelengths.

The red flour beetle (Tribolium castaneum) is a common pest that attacks milled grain products such as flour and cereals. It is a cryptozoic insect, meaning that it lives in the dark. Markus Friedrich from Wayne State University in Detroit, along with colleagues from St Louis and Cincinnati, performed genetic analyses to probe the evolution of the species' vision.

The opsin gene family is central to vision. The authors found that the beetle's compound eye retina lacked the blue-opsin encoding photoreceptors. Their work also identified the red flour beetle as the first example of an insect species that switches on two opsin genes across the entire retina. This co-expression of genes violates the 'one receptor rule' of sensory cells.

The research suggests that the beetle may have gained an evolutionary advantage through this adaptation. Dr Friedrich states that the work "raises the possibility that opsin co-expression is of advantage under conditions where brightness sensitivity is critical."

The study points the way to broader studies of the development and biology of this pest species. It also suggests that the red flour beetle may be a promising subject for further investigation of cryptozoic animals' evolution.

Source: BioMed Central