

Thorsteinson A J. Host selection in phytophagous insects.
Annu. Rev. Entomol. 5:193-218, 1960.
[Dept. Entomology, Univ. Manitoba, Winnipeg, Canada]

Host selection by herbivorous insects is defined in terms of sensory cues involved in the component behavioral processes. The logic of host plant selection patterns is considered in relation to a review of theories. [The SC/® indicates that this paper has been cited over 170 times since 1961.]

A. J. Thorsteinson
516 West 50th Avenue
Vancouver, British Columbia V6P 1A2
Canada

August 23, 1980

"This review was invited by the editorial committee presumably because of my 1953 paper which showed that glucosinolates, e.g., sinigrin or sinalbin, are essential to induce larval feeding by the oligophagous insect, the diamond-back moth.¹ Since the botanical distribution of glucosinolates is congruent with the host plant range of this insect, its host selection mechanism is explained.

"This finding was an extension of Verschaffelt's demonstration half a century earlier that sinigrin regulates host selection of the cabbage caterpillars (*Pieris* spp.) providing the classical example of a chemical 'sign stimulus' — the taste or odor of a constituent unique to the host plants and essential to recognition and acceptance by an insect species.²

"The search for a sign stimulus serving the Colorado potato beetle challenged several investigators through four decades but no host specific feeding stimulant was

isolated. When I found that certain simple nutrients, ubiquitous in plants, suffice to induce the larvae to feed it seemed to me proven that, for the Colorado beetle, no sign stimulus for feeding exists and that the food plant range is determined solely by a highly specific tolerance for a few potentially inhibitory plant constituents (e.g., solanin). A generalization of this interpretation has been accepted for polyphagous insects ever since it was proposed by Wardle,³ but has been largely ignored as an explanation of oligophagy. On the evidence, I felt justified in presenting this neglected hypothesis as well as the sign stimulus paradigm as mechanisms effecting oligophagy in diverse insects. In retrospect, it would seem that the former is logically an evolutionary prerequisite to the latter.

"This dual view conflicted with the thought of my former teacher G. S. Fraenkel. It was distressing to read that he sensed an animosity toward him⁴—I am aware only of a baffling semantic barrier. His collaborator, Hsiao, massively confirmed my observations on the Colorado beetle without, however, renouncing the sign stimulus interpretation until much later: '... there is no experimental evidence ... that host-specific stimuli ... play significant roles in larval feeding behaviour ... deterrent chemicals may be the key factors in explaining oligophagy. ...'⁵

"While it is most gratifying to know that my review has been so frequently cited it is perplexing that, as far as I know, only one paper cited it in the foregoing context.⁶ I would like to believe that some result of my effort to discuss host selection in a logically holistic way might account for the frequency of citation, apart from its favorable timing early in the spate of publications generated directly or indirectly by the series of symposia^{4,5} promoted largely by Jan de Wilde, University of Wageningen."

1. **Thorsteinson A J.** The chemolactic responses that determine host specificity in an oligophagous insect (*Plutella maculipennis* (Curt.) Lepidoptera). *Can. J. Zool.* 31:52-72, 1953.
2. **Verschaffelt E.** The cause determining the selection of food in some herbivorous insects. *Proc. Acad. Sci. (Amsterdam)* 13:536-42, 1910.
3. **Wardle R A.** *The problems of applied entomology.* Manchester, England: Manchester University Press, 1929. 587 p.
4. **Fraenkel G.** Evaluation of our thoughts on secondary plant substances, (de Wilde J & Schoonhoven L M, eds.) *Insect and host plant: proceedings of the 2nd International Symposium, 2-5 June 1969, Wageningen, The Netherlands.* Amsterdam: North Holland, 1970. p. 473-86.
5. **Hsiao T H.** Chemical and behavioral factors influencing food selection of *Leptinotarsa* beetle. (Jermy T, ed.) *The host-plant in relation to insect behaviour and reproduction.* New York: Plenum Press, 1976. p. 99.
6. **Ritter F J.** Feeding stimulants for the Colorado beetle. *Mededeingen Rijksfaculteit Landbouwwetenschappen* 32:291-305, 1967.