RESEARCH NOTES

Hatching Response of the Sugarbeet Nematode, *Heterodera schachtii*, to Electric Shock[1]

A. E. STEELE, F. E. CAVENESS, AND C. E. CAVENESS[1]

The effects of electric fields on galvanotactic behavior and survival have been investigated for a number of free-living and parasitic nematodes (1, 3, 4). Recent work demonstrated electrostimulation of egg masses of *Meloidogyne incognita acrita* Chitwood 1949 increased the rate of hatch (2); similar experiments have not been reported for other nematode species. Consequently, we attempted to increase hatching of larvae from cysts of the sugarbeet nematode, *Heterodera schachtii* Schmidt 1871, by electrical stimulation to determine whether a species outside the genus *Meloidogyne* reacts similarly.

The electrical apparatus used was described by Caveness and Caveness (1). Cysts

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[1] Nematologists, Agricultural Research Service, Crops Research Division, U. S. Department of Agriculture, Salinas, California 93901, Shafter, California 93263, and Senior Electrical Engineer, Space Division, North American-Rockwell Corporation, Downey, California 90300. The authors are indebted to Madeline Mullins and Margaret DeMoss for their assistance.

TABLE 1. The influence of electric stimulation on hatching of larvae from encysted and free eggs of *Heterodera schachtii*.

Electric Potential	Maximum Current (ma)	Tap Water[1]				Beet Root Diffusate			
		Cysts[2]		Eggs		Cysts		Eggs	
		2[3]	60	2	60	2	60	2	60
					Test Number 1				
1 VAC	.27	1,014	1,443	1,320	819	13,559	12,303	11,241	13,346
1 VDC	.01	1,635	1,404	1,362	1,400	10,608	13,716	13,197	12,719
10 VAC	2.0	1,652	405	861	1,345	13,525	12,225	10,260	12,474
10 VDC	2.0	1,022	1,604	1,123	958	12,508	13,907	12,811	14,609
20 VAC	2.0	823	1,360	799	1,138	12,182	13,436	13,992	12,220
20 VDC	2.0	937	—	1,378	1,336	13,398	13,224	11,722	14,859
60 VAC	2.0	—	—	—	—	14,289	—	11,936	14,620
60 VDC	2.0	888	1,821	1,193	922	13,772	14,119	12,694	13,185
Untreated		1,694		1,567		14,350		10,308	
					Test Number 2				
1 VAC	.45	3,096	2,172	4,107	4,731	8,615	10,290	9,944	8,939
1 VDC	130	3,144	3,049	2,715	2,713	9,042	9,350	8,851	10,639
10 VAC	12	3,395	2,370	4,711	3,641	10,005	10,909	9,721	9,346
10 VDC	80	3,104	2,991	3,999	3,717	8,522	10,490	10,816	9,296
20 VAC	12	2,003	1,515	3,898	2,924	10,406	10,167	9,969	9,010
20 VDC	160	2,779	4,235	2,784	2,787	10,424	9,554	8,457	4,956
60 VAC	12	1,255	1,797	3,187	4,254	9,766	10,625	10,589	11,041
60 VDC	360	4,235	2,808	1,667	202	3,934	2	922	659
Untreated		3,328		4,316		7,857		11,289	

[1] Hatch media.
[2] Eggs within cysts (cysts) or eggs removed from cysts (eggs). Number of larvae hatched. Average of 5 reps each containing 10 cysts, during a 3-week period after treatment.
[3] Length of time (sec) cysts or eggs were exposed to electrical treatments.

or eggs removed from cysts were suspended in tap water between the electrodes. Each treatment, with suitable controls, was replicated five times and each replication consisted either of 10 cysts or the eggs from 10 cysts. In two tests, eggs or cysts were exposed to the treatments listed in Table 1, then placed in tap water or sugarbeet root diffusate; hatch was recorded for a period of 3 weeks. The second test repeated the treatments on the first test except that the current was adjusted to 2 milliamperes for each voltage tested.

The AC or DC voltages tested caused no increase in hatch of *H. schachtii* larvae in tap water or diffusate. Hatching from cysts or free eggs was decreased at 60 VDC/mm at 50–350 milliamperes. Sixty VDC/mm or VAC/mm at 10 milliamperes or less had no measurable effect on hatch (Table 1).

These results indicate a difference in the physiology of hatching between *Meloidogyne* and *Heterodera*. From a practical standpoint, control of the sugarbeet nematode cannot be realized by electrical stimulation of hatching.

LITERATURE CITED

1. CAVENESS, F. E., AND C. E. CAVENESS. 1970. Nematode electrocution. J. Nematol. 2: 298–304.
2. CAVENESS, C. E., AND F. E. CAVENESS. 1970. Hatching response of *Meloidogyne incognita acrita* to electric shock. J. Nematol. 2:294–297.
3. LEE, P. L. 1965. The physiology of nematodes. University Reviews in Biology. W. H. Freeman and Company, San Francisco. 154 p.
4. SOUTHEY, J. F. (ed.). 1965. Plant Nematology. Tech. Bull. 7. 2nd ed. Min. Agr. Fisheries and Food. Her Majesty's Stationery Office, London. 282 p.