Effect of Microwave Treatments on the Germination of Seeds

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MATERIALS AND METHODS

Twenty-five seeds each of *Leucanthemum* ×*superbum* 'Alaska' (syn. *Chrysanthemum maximum* 'Alaska'),*Lathyrus latifolius*, and*Eschscholzia californica* (California poppy) were soaked in cold water for 24 h. Seeds were then removed and placed upon moist paper towels. The seeds were subjected to 900 watts microwave radiation for a specified period of time, sown in a tray of sterile soil, and germinated in a greenhouse at 70F. Germination results were taken daily with the final counts made on Day 10 of the test period.

The resulting seedlings were place in identical garden situations (except*Lathryus* was not set out due to lack of space) to evaluate longer-term effects.

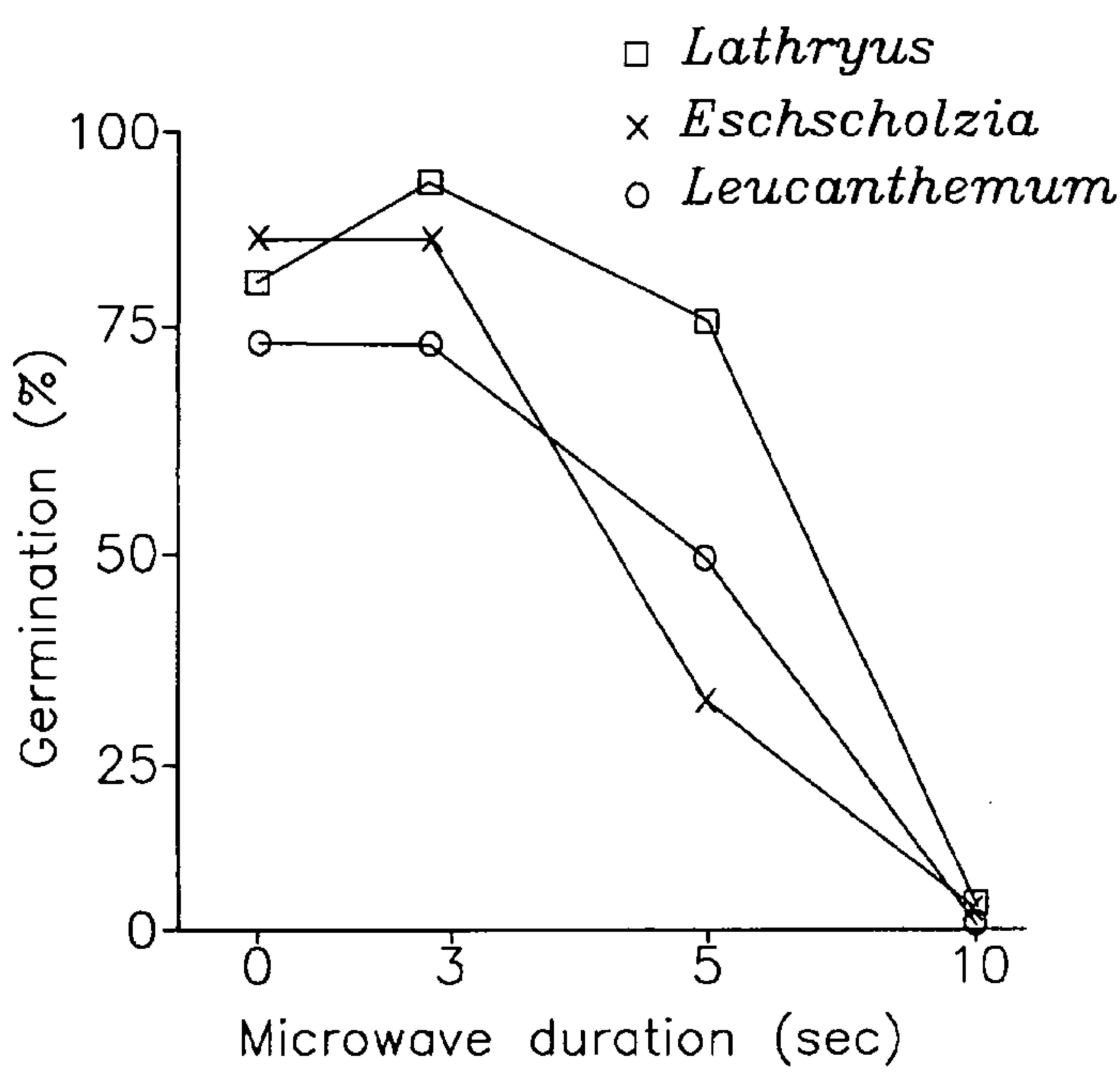

Figure 1. Effect of microwave duration on seed germination of three species.

Table 1. Germination of *Lathryus, Eschscholzia,* and *Leucanthemum* after varying exposure times to microwave radiation.

	Number germinated per day									
Treatment (sec)	1	2	3	4	5	6	7	8	9	Total
Lathryus latifolius										
0	0	0	0	0	0	12	2	4	2	20
3	0	0	0	0	0	14	2	5	3	24
5	0	0	0	0	0	14	1	1	1	17
10	0	0	0	0	0	1	0	0	0	1
Eschscholzia californica										
0	0	0	0	0	0	19	2	0	0	21
3	0	0	0	0	0	19	2	0	0	21
5	0	0	0	0	0	5	1	1	0	8
10	0	0	0	0	0	0	0	0	0	0
Leucanthemum ×superbum 'Alaska'										
0	0	0	0	0	0	0	0	15	2	17
3	0	0	8	4	4	1	0	0	0	17
5	0	0	1	4	6	3	0	0	0	12
10	0	0	0	0	0	0	0	0	0	0

Table 2. Growth of seedlings after microwave treatment of seed.

Treatment		Number planted out and response
Leucanthemum ×superbum 'Alaska'		
	0	17
	3	17+
	5	12*
Eschscholzia		
	0	21
	3	21**
	5	8

* Two dwarfs were selected from this treatment and not planted with the others, for a total of 14 plants.

\+ Of these, two plants bloomed with normal flowers, none of the other plants either controls or those treated for 5 sec bloomed.

** Of these two plants bloomed white, none of the control plants had white flowers. Normal flower color is orange to yellow.

DISCUSSION

In normal nursery practice many seeds are exposed to water, hot water, and even boiling water soaks or pretreatments. It is obvious that water has an important part in seed germination but it is not clear what role if any the heat may have in conjunction with the water. Microwaves are a means of applying precise doses of heat to seeds in a very manageable and reproducible manner. It has been suggested by Deno (1993) and others that heat is causing a physical change in the seed coat which then in turn allows for the entrance of water to facilitate germination. Perhaps the role of heat in seed germination is more than a merely physical treatment. It is possible that applied heat is having an effect upon enzyme action, the elimination of specific germination inhibitors, or some other activity such as the turning on of a specific genes that promote germination.

The results presented here are merely preliminary and are too early to demonstrate a specific trend. Also, it should be noted that different plant taxa respond differently to the same microwave treatment. Note the fact that *Lathryus* will tolerate a higher dosage of microwaves than will *Eschscholzia* and *Leucanthemum* and that *Leucanthemum* will tolerate higher levels of radiation than *Eschscholzia* (Fig. 1).

LITERATURE CITED

Deno, N. 1993. Seed germination, theory and practice. State College, Pennsylvania

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