

## LACK OF HYPERSENSITIVE REACTION IN THIRTY PLANT SPECIES INOCULATED WITH *Agrobacterium tumefaciens*

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In 1964, KLEMENT *et al.* (6) demonstrated that a hypersensitive reaction was induced by injection of a concentrated suspension of pathogenic bacteria into non-susceptible plants. Since then, this phenomenon has been demonstrated in many different non-host-pathogenic-bacteria combinations (7, 8), but none have included tests with *Agrobacterium* species. The purpose of this study was to determine whether *Agrobacterium tumefaciens* could induce hypersensitive reactions in 30 different species of cultivated plants.

The isolate of *A. tumefaciens* used, taken originally from a gall on *Kalanchoe digremontiana*, was obtained from Dr. Júlio Rodrigues Neto, Instituto Biológico de São Paulo, SP. Plants of the 30 species chosen (Table 1) were inoculated as soon as the first pair of leaves developed. The bacteria were grown in the medium used by KADO *et al.* (4). The culture flasks were kept in constant agitation at 20-25°C for 48 hours, and the suspension was centrifuged down at 2,000 rpm for 30 minutes. The supernatant was discarded, and the sediment was resuspended in 0.85% saline solution (1, 3, 9). The concentration was adjusted to  $10^8$ – $10^9$  cells/ml (2, 5, 6). Two different methods were used for inoculation: injection into the leaves (5, 6) and wounding. The latter was done with a needle coupled to a camel's hair brush (5), jabbing the plant two or three times at the soil level. The plants were kept on a greenhouse bench and observed for the hypersensitive reaction 46 hours later with the naked eye or a stereo microscope when necessary. Gall formation was observed up to 60 days after inoculation.

Table 1 shows that *A. tumefaciens* did not provoke a hypersensitive reaction in any of the 30 plant species inoculated. In tomatoes and sunflowers, however, a yellowing was noticed in the inoculated area. Instead of hypersensitive reaction, small leaf galls occurred in tobacco and *Kalanchoe digremontiana*. When inoculated by wounding, *A. tumefaciens* caused stem gall formation in castor beans, sunflowers, tomatoes, potatoes, tobacco, cheyote, *K. digremontiana* and cordia.

The results indicate that, even though the isolate was pathogenic and 22 plant species were resistant or immune, no hypersensitive reaction occurred, despite the fact that hypersensitive reactions commonly occur with other bacterial species in this kind of incompatible host-parasite relationship. It seems, therefore, that *A. tumefaciens* is an exception to the general concept that hypersensitive reaction will occur in combinations of normally virulent bacteria with resistant host plants or pathogenic bacteria with non-host plants (6).

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TABLE 1 - Reaction of 30 plant species to inoculation with an isolate of *Agrobacterium tumefaciens*. Viçosa, MG, 1976

Plant	Hypersensitive reaction	Gall formation
<i>Allium sativum</i> , Liliaceae (Garlic)	-	-
<i>Arachis hypogea</i> , Leguminosae (Peanut)	-	-
<i>Brassica oleraceae</i> var. <i>acephala</i> , Cruciferae (Kale)	-	-
<i>Brassica oleraceae</i> var. <i>capitata</i> , Cruciferae (Cabbage)	-	-
<i>Capsicum annuum</i> , Solanaceae (Green pepper)	-	-
<i>Carica papaya</i> , Caricaceae (Papaya)	-	-
<i>Citrus sinensis</i> , Rutaceae (Orange)	-	-
<i>Coffea arabica</i> , Rubiaceae (Coffee)	-	-
<i>Colocasia antiquorum</i> , Araceae (Elephant's-ear)	-	-
<i>Cordia goeldiana</i> , Boraginaceae (Cordia)	-	+
<i>Cucurbita</i> sp., Cucurbitaceae (Squash)	-	-
<i>Glycine max</i> , Leguminosae (Soybean)	-	-
<i>Helianthus annuus</i> , Compositae (Sunflower)	- b	+
<i>Kalanchoe digremontiana</i> , Crassulaceae	- a	+
<i>Lactuca sativa</i> , Compositae (Lettuce)	-	-
<i>Lantana camara</i> , Verbenaceae (Lantana)	-	-
<i>Lycopersicon esculentum</i> , Solanaceae (Tomato)	- b	+
<i>Manihot utilisima</i> , Euphorbiaceae (Cassava)	-	-
<i>Musa paradisiaca</i> , Musaceae (Banana)	-	-
<i>Nicotina tabacum</i> , Solanaceae (Tobacco)	- a	+
<i>Piper nigrum</i> , Piperaceae (Black pepper)	-	-
<i>Phaseolus vulgaris</i> , Leguminosae (Bean)	-	-
<i>Phytolacca caruru</i> , Phytolaccaceae	-	-
<i>Pisum sativum</i> Leguminosae (pea)	-	-
<i>Psidium guajava</i> , Myrtaceae (Guaya)	-	-
<i>Ricinus communis</i> , Euphorbiaceae (Castor bean)	-	+
<i>Rosa</i> sp., Rosaceae (Rose)	-	-
<i>Sechium edule</i> , Cucurbitaceae (Cheyote)	-	+
<i>Solanum tuberosum</i> , Solanaceae (Potato)	-	+
<i>Tecoma chrysostricha</i> , Bignoniaceae	-	-

a - Small leaf galls were formed at the injection sites.

b - The plants showed a yellowing in the inoculated area.

## RESUMO

*Agrobacterium tumefaciens* não provocou reação de hipersensibilidade em 30 espécies de plantas hospedeiras e não hospedeiras. Isto indica que esta bactéria não se comporta como a maioria das outras bactérias fitopatogênicas, que, ao serem inoculadas em plantas resistentes ou não hospedeiras, induzem reações de hipersensibilidade.

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