Datura metel L. as a Virus-Indicator Plant

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Accepted for publication 10 March 1970.

ABSTRACT

Datura metel is recommended as a virus-indicator plant. A total of 28 distinct symptoms were consistently incited by a group of 19 isolates of 12 mechanically-transmitted viruses. Because of the vast array of symptoms incited on *D. metel*, this species would be particularly useful for comparing "known" viruses with "unknowns", and as a teaching aid. Phytopathology 60:1183-1185.

Datura metel has been used frequently in virus host-range studies, particularly with viruses that infect Solanaceous plants, but only a few reports emphasize its diagnostic value. *Datura metel* has been reported as a diagnostic plant for potato virus M (1) and for strains of bromegrass mosaic virus (4) and raspberry ringspot virus (2). In combination with other indicators, *D. metel* was useful in differentiating between five viruses in the potato virus Y group (3), and was reported as a good local lesion test plant for potato virus X (5).

We inoculated *D. metel* plants with virus isolated from a wide range of herbaceous plant introductions and with known virus cultures. Seedlings dusted with 320-mesh Carborundum, were inoculated in the five- to seven-leaf stage. Inoculum was prepared by grinding infected tissue in a mortar, usually with 0.01 M potassium phosphate buffer at pH 7 or with 1% K_2HPO_4. The known virus cultures were represented by one isolate unless otherwise indicated. Inoculated plants were incubated under greenhouse conditions for 4 to 5 weeks during spring, fall, or winter months. Symptom descriptions were based on 4-10 replications of three to five plants each.

Datura metel responded to virus infection, depending on the virus, with one or more of at least 28 distinctive symptoms, 23 of which are listed in Table 1, Fig. 1, or both. The other five symptoms not tabulated or shown are (i) stunting; (ii) leaf curl due to distortion of the main vein; (iii) stippling; (iv) necrosis of growing points; and (v) dark green veinbanding, usually with interveinal chlorosis.

Symptoms were not incited by the following viruses: bean yellow mosaic; bean common mosaic; bean southern mosaic; carnation mottle; carnation latent; and carnation mosaic viruses.

The reactions of five polyhedral and seven rod-shaped viruses are tabulated for 20 symptoms (Table 1). The symptoms were consistently incited by the virus isolates in 4 to 10 replications. The symptom response was not noticeably influenced by differences in greenhouse conditions during September through July at Glenn Dale, Md. Although we were able to consistently obtain these results with the isolates employed, we only tested one isolate of each for 9 of the 12 viruses. As testing several isolates of each virus was beyond the scope of our project, we are not in a position to describe the specific virus reactions that should be based on a number of isolates.

Instead, we endorse the use of *D. metel* as an indicator plant because of the vast array of symptoms incited by viruses. The plant should be useful in comparing an "unknown" with a "known". Within our small sampling, *D. metel* consistently separated necrotic and nonnecrotic strains of potato virus Y. In addition, tomato aspermy incited a different symptomatology than did chrysanthemum aspermy. The Colombian Datura, henbane mosaic, and tobacco etch viruses could not be distinguished from each other, but they could be distinguished from the other nine viruses. Necrotic symptoms were incited by six out of seven rod-shaped viruses (all but potato virus Y), but only by one (tobacco ringspot virus) out of five polyhedral viruses.

We endorse the use of *D. metel* as an indicator plant and also as an aid for teaching. Our recommendation is based on the total of 28 different symptoms consistently incited by 19 isolates of 12 viruses.

LITERATURE CITED

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TABLE 1. Major symptoms incited by five polyhedral and seven rod-shaped viruses on *Datura metel* L.

Virus	Symptoms on *D. metel*[a, b]																		
	Nonnecrotic													Necrotic					
	CS	CB	Rg	Dis	En	LC	CR	Mt	M	Var.	P	MVB	SVB	NR	LN	NS	LD	W	D
Polyhedral																			
Cucumber mosaic (Y strain)	+	+	+	+	−	−	−	+	−	−	+	−	−	−	−	−	−	−	−
Chrysanthemum aspermy																			
(Grogan isolate)	+	−	−	−	+	+	−	−	+	+	−	−	−	−	−	−	−	−	−
(Noordam strain)	+	−	−	−	±	±	−	−	+	+	−	−	−	−	−	−	−	−	−
Tomato aspermy (Blencowe strain)	+	−	−	−	−	−	+	+	+	−	−	−	−	−	−	−	−	−	−
Tobacco ringspot	+	−	−	−	−	−	+	+	−	−	−	−	−	+	−	+	−	−	−
Alfalfa mosaic (potato isolate)	+	−	−	−	−	+	+	−	−	−	−	−	−	−	−	−	−	−	−
Rod-shaped																			
Tobacco mosaic virus	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	−	+
Potato virus X (ringspot strain)	+	−	−	−	−	−	−	−	−	−	−	+	−	−	−	+	−	−	−
Henbane mosaic	+	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+
Colombian Datura	+	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+
Tobacco etch[d]	+	−	+	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	−
Potato virus M	+	−	−	−	+	+	−	−	−	−	−	−	−	−	−	−	−	−	−
Potato virus Y	−	−	−	−	−	−	−	±	−	−	−	+	−	−	−	−	−	−	−
(veinbanding strain)[c]	−	−	−	−	−	−	−	±	−	−	−	−	+	−	−	−	−	−	−
(tobacco veinal necrosis strain)[d]																			

[a] Four to 10 replications of three to five plants each. + = Incites symptoms; − = does not incite symptoms; ± = sometimes incites symptoms.

[b] CS = Chlorotic spots; CB = chlorotic blotch; Rg = rugose; Dis = leaf distortion; En = enation; LC = leaf curl or roll; CR = chlorotic rings; Mt = mottle; M = mosaic; Var. = variegation; P = puckering; MVB = mild veinbanding; SVB = severe veinbanding; NR = necrotic rings; LN = leaf necrosis; NS = necrotic spots; LD = leaf drop; W = wilting; D = death of plants.

[c] Two isolates.

[d] Three isolates.

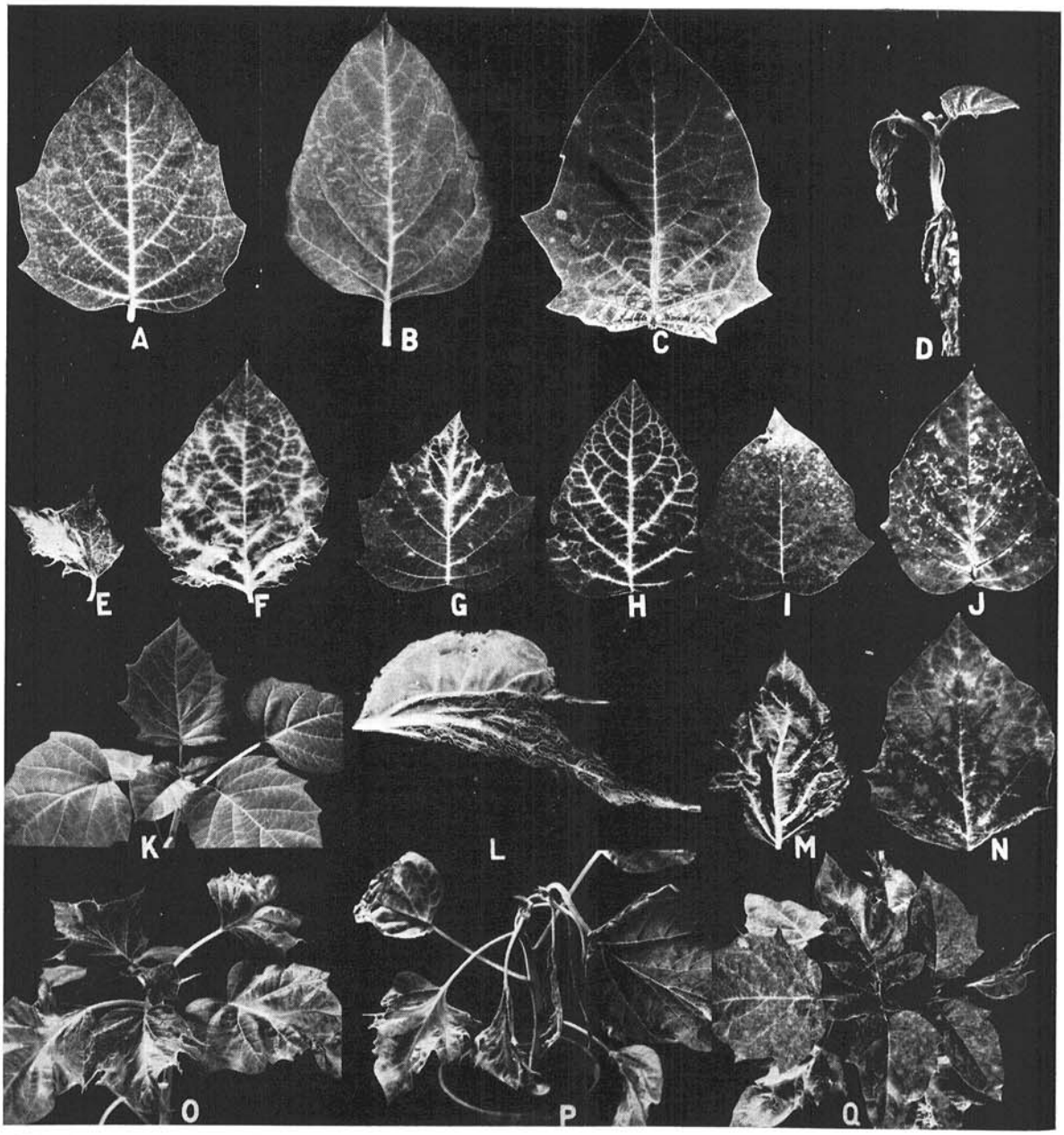

Fig. 1. Representative symptoms incited by various mechanically transmitted viruses on *Datura metel* L. Chlorotic spots, A, I, Q; line pattern, B; necrotic spots, C, D, J; veinbanding, F, G, H; featherlike veinbanding, F, G; leaf distortion, E, L, O, P; mottle, I, N; necrotic ringspots, J: enations, L, M, N, Q; epinasty, P; leaf necrosis, D; variegation, E, Q; rugosity, O; leaf margin rolled down, B; leaf curled downward lengthwise, D, O. Healthy, K.