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Transitory Yellowing of Chinese Cabbage¹

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Abstract. Transitory yellowing, a new disease of Chinese cabbage (*Brassica campestris* L. ssp. *pekinensis* Rupr.), was noticed in 1971 in the Lalamilo area on the Island of Hawaii. The disease was not associated with pathogenic microorganisms. The susceptibility varies with cultivar but no cultivar proved to be resistant. In the disease-free Volcano area no symptoms developed on plants growing in soil collected from the diseased area at Lalamilo. Application of a complete fertilizer or pH adjustment of soil did not alleviate the disease symptoms. Disease symptoms disappeared within 3 days when plants were transported from a diseased area to a healthy area. Results suggest that the new disease is caused by an unknown airborne agent present in the diseased area.

A new disease of Chinese cabbage was noticed in 1971 in the Lalamilo area on the Island of Hawaii. The major symptoms are yellowing from the margin of the acropetal regions of both mature and immature leaves, and prevention of heading in the severe cases. The diseased leaves never turn necrotic, but *Alternaria* leaf spot (3) becomes prevalent on older leaves of plants infected with the new disease. The disease is most serious during winter. Sometimes, for a reason still unknown the symptoms disappear and the plants appear healthy again. The characteristic vascular discoloration associated with yellow diseases of cabbage caused by *Fusarium oxysporum* f. sp. *conglutinans* (3) and *Verticillium albo-atrum* (4) was not observed. Neither bacteria nor fungi were consistently isolated from diseased tissues. In preliminary trials, virus particles and microbial cells were not observed in electron micrographs of ultra-thin sections of diseased tissues.

The susceptibility of 29 cultivars of Chinese cabbage to the transitory yellowing was tested in a randomized complete block trial with 3 replications. A sample of these results is presented in Table 1. The susceptibility varied with

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cultivars but none was totally resistant.

A yellowing symptom of Chinese cabbage caused by a sugar cane ripener, glyphosine (*N, N*-bis (phosphonomethyl) glycine), has been reported recently (2). The possibility of injury due to glyphosine drift was enhanced by the relative proximity of the Lalamilo area to foliar treated sugar cane fields and the frequent occurrence of winds in excess of 20 km/hr. However, the symptoms on Chinese cabbage sprayed with various rates of glyphosine were not the same as those caused by the transitory yellowing. Glyphosine treated leaves became necrotic one week after the appearance of leaf yellowing. Since glyphosine has low volatility (1), it is very unlikely that the transitory yellowing is caused by vapor of this compound. Low temperature does not seem to be the cause of the disease. Winter temperature ranges of the disease-free Hilo and Volcano areas are 16-26°C and 8-18°C, respectively, while that of the diseased Lalamilo area is 12-22°C. The disease also does not appear to be related to soil pH or nutritional factors. Altering the soil pH from the original 5.2 to 6.1 and 4.7 by addition of lime and wettable sulfur, respectively, did not reduce disease incidence. Neither Lalamilo rainwater nor oceanwater caused symptom expression when sprayed on healthy plants.

Chinese cabbage developed yellow symptoms at Lalamilo whether grown in soil from Lalamilo or in soil from the disease-free Volcano area (Table 2). In the disease-free Volcano area no symptoms developed on plants growing in soil collected from the diseased area

Table 1. Disease susceptibility of 6 Chinese cabbage cultivars at 42 days after seeding.

Cultivar	Disease ² incidence (%)
Mikado Res. 55 days	8 c ²
Nagaoka 55 days	23 bc
Nagaoka 60 days	16 c
Oriental King	61 a
Sensho	45 ab
W. R. 60 days	29 bc

²Mean separation by Duncan's multiple range test, 5% level. Data are based upon discernable symptom expression regardless of severity.

Table 2. The effects of soil type and location on transitory yellowing.

Experimental Location	Origin of soil	Diseased incidence (%)
Lalamilo (diseased area)	Lalamilo (Waimea silt loam)	14 a
	Volcano (Manu silt loam)	12 a
Volcano (healthy area)	Lalamilo	0 b
	Volcano	0 b

²Mean separation by Duncan's multiple range test, 5% level.

at Lalamilo. All symptoms invariably disappeared within 3 days when diseased plants in 10 liter containers were transported to Hilo at ambient temperature or in an ice chest and placed in a greenhouse with temperatures lower than 18°C. These results suggest that the transitory yellowing of Chinese cabbage is caused by an unknown airborne agent present at Lalamilo.

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