Reaction of Banana Cultivars to the Burrowing Nematode (Radopholus similis)

E. J. WEHUNT, D. J. HUTCHISON, and D. I. EDWARDS[1]

Methods now used to control the burrowing nematode, *Radopholus similis* (Cobb) Thorne, on banana, *Musa acuminata* Colla, involve repeated application because of reinfestation. A commercially acceptable resistant variety would be desirable. Leach (2) reported that 'Gros Michel' (AAA-'Pisang Ambon') was much less severely affected by *R. similis* than was 'Lacatan' (AAA-'Pisang masak hijau'). [The designations in parentheses follow Simmonds (3) genome classification which is based on the relative quantities of *M. acuminata* (A) and *Musa balbisiana* Colla (B) characteristics.]

Several hundred cultivars and varieties of *Musa* spp. were introduced into Honduras for a banana breeding program. Two experiments were designed to determine whether a source of tolerance or resistance to *R. similis* was available in selected accessions from that collection. Preliminary results have been presented (4).

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[1] Research Plant Pathologist, U. S. Department of Agriculture, Science and Education Administration, Southeastern Fruit and Tree Nut Laboratory, Byron, Georgia 31008; Research Geneticist, U. S. Department of Agriculture, Science and Education Administration, U. S. Horticultural Research Laboratory, Orlando, Florida 32803; and Research Plant Pathologist, U. S. Department of Agriculture, Science and Education Administration, 107F Horticulture Field Laboratory, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801. This work was done at the Tropical Research Department of United Brands Co., La Lima, Honduras.

The first experiment was conducted to determine whether the edible triploid cultivars presently used or being considered as commercial varieties showed tolerance or resistance to *R. similis*. Seven cultivars were tested: 'Cocos,' a dwarf sport of 'Gros Michel,' and six 'Cavendish' varieties. The experiment was a randomized complete block with plots of 30 plants each and six replications. The first experimental site had no history of *R. similis* infestation. Rhizomes were placed in planting holes artificially infested with about 3 kg of *R. similis*-infested banana rhizome tissue, a quantity sufficient to induce severe *R. similis* damage on newly planted susceptible bananas and other plant species (1). Six months after planting, a daughter rhizome was removed from each plant, examined, and rated for *R. similis* damage.

Root-lesion ratings were assigned as follows: 0, no lesions; 1, slight infection, few lesions 1 mm or less in diameter; 2, moderate infection, many lesions 1 mm or less or a few lesions larger than 1 mm in diameter; 3, severe infection, many lesions larger than 1 mm in diameter, a few coalesced into area greater than 1 cm in diameter; 4, very severe infection, many lesions 1 cm in diameter, some coalesced into lesions greater than 5 cm. Ratings were transformed to $\sqrt{x} + 0.5$ to eliminate zeros before analysis

TABLE 1. Reaction to *Radopholus similis* of edible triploid banana varieties (Experiment I) and *Musa acuminata* cultivars (Experiment II).

Cultivar	Cultivar group	Root-lesion rating[1]
Experiment I		
Grand Naine	Cavendish Robusta	2.76 a
Tumoc	Cavendish Robusta	2.73 ab
Valery	Cavendish Robusta	2.53 bc
Lacatan	Cavendish Robusta	2.48 b-d
Giant Fig	Cavendish Robusta	2.37 c-e
Jamaica Unknown	Cavendish Robusta	2.20 e
Cocos	Pisang Ambon	1.60 f
Experiment II		
Paitan	Lonsing	4.00 a
Guyod	Banksii derivative	3.89 a
Tjau Lampeneng	Banksii derivative	3.89 a
M.a. subsp. *banksii*		3.56 ab
Pisang Telor	Microcarpa derivative	3.56 ab
Pisang Sa-Ribu (II-137)	Pisang Tongat	3.44 a-c
Manang	Manang	3.33 a-d
Pitu (III-205)	Pitu	3.33 a-d
M.a. subsp. *microcarpa*		3.11 a-d
Pisang Keretas	Pisang Tongat	3.11 a-d
Padri	Pitu	3.00 a-e
Pu-te Wey	Pisang Tongat	3.00 a-e
Chuoi Cau Trang	Pisang Mas	2.89 a-f
Sinwobogi	Banksii derivative	2.89 a-f
Ompong	Banksii derivative	2.78 a-g
Pisang Buntal	Pisang Mas-Pisang Madu	2.78 a-g
Pisang Rotan (II-252)	Pisang Jari Buaya	2.78 a-g
Pisang Kendik	Pisang Madu	2.67 a-h
Valery	Cavendish Robusta	2.67 a-h
Lonsing	Lonsing	2.56 a-h
Pisang Rarangkai	Pisang Tongat	2.56 a-h
Pitu (III-206)	Pitu	2.56 a-h
Djum Pet	Djum Pet	2.44 a-i
Pisang Sa-Ribu (II-190)	Pisang Tongat	2.44 a-i
Pisang Tembaga Ikal	Zebrina derivative	2.44 a-i
Pu-te La-Bum	Pisang Tongat	2.44 a-i
Lidi	Pisang Lidi	2.33 a-j
Pisang Bungai	Pisang Madu	2.33 a-j
Pisang Madu	Pisang Madu	2.22 a-j
M.a. subsp. *zebrina*		2.22 a-j
Djum Metek	Djum Metek	2.11 a-k
Tjau Regang	Tjau Lagada	2.11 a-k
Beraum	Djum Pet	2.00 a-l
Tjau Lagada	Tjau Lagada	2.00 a-l
Pisang Jarum	Pisang Madu	1.89 b-l
Sapnay	Manang	1.78 c-m
Unknown	Djum Metek	1.44 d-n
Pisang Perak	Pisang Lidi	1.33 e-o
Inabaca	Inambak	1.22 f-o
Morong Datu	Pisang Jari Buaya	1.22 f-o
Ton Djum	Banksii derivative	1.22 f-o
Pisang Mas Ayer	Pisang Mas-Pisang Madu	1.11 g-o
Siang-Hil	Pisang Batuau	0.89 h-o
Tangung	Pisang Batuau	0.89 h-o
Basilan Diploid	Pisang Batuau	0.78 i-o
Pisang Rotan (II-275)	Pisang Jari Buaya	0.78 i-o
Umbarim	Pisang Jari Buaya	0.78 i-o
Pisang Ekor Kuda	Pisang Lidi	0.67 j-o
Pisang Jari Buaya	Pisang Jari Buaya	0.67 j-o
Biu Ganchang	Pisang Jari Buaya	0.44 k-o
Pisang Gigi Buaya	Pisang Jari Buaya	0.44 k-o
Pisang Tunjuk	Pisang Jari Buaya	0.44 k-o
Biu Batu	Pisang Batuau	0.33 l-o
Misui	Pisang Batuau	0.22 m-o
Pisang Batuau	Pisang Batuau	0.22 m-o
Pisang Kermian	Pisang Lidi	0.22 m-o
Saing Todlon	Pisang Jari Buaya	0.22 m-o
M.a. subsp. *malaccensis*		0.22 m-o
Morong Princesa	Pisang Jari Buaya	0.11 no
Pisang Sipulu	Pisang Jari Buaya	0.11 no
Gaban Gabah	Pisang Jari Buaya	0.00 o
Hawundu Vita	Pisang Jari Buaya	0.00 o
Unknown	Pisang Jari Buaya	0.00 o
Mundan	Microcarpa derivative	0.00 o

[1]For each experiment, means followed by common letters do not differ significantly (P=0.05) by Duncan's multiple-range test.

of variance; but results are presented here without transformation. Statistical significance of difference between means was determined with Duncan's multiple-range test.

Results of the first experiment (Table 1) support observations of Leach (2) that the 'Cavendish' group of *M. acuminata,* represented by 'Jamaica unknown,' 'Lacatan,' 'Valery,' 'Giant Fig,' 'Grande Naine,' and 'Tumoc,' was more susceptible to *R. similis* than was the 'Pisang Ambon' ('Gros Michel') group, represented by 'Cocos.'

The site of the second experiment had a history of severe *R. similis* infestation. Even so, 3 kg of infested rhizome tissue was added to ensure uniformly high infestation throughout the experiment. Sixty-four accessions were planted in an 8 × 8 balanced

lattice design with nine replicates. All accessions were of special interest in the breeding program. Included as a susceptible check was the commercial variety 'Valery.' One row of 'Valery' was planted as a border around the experimental area. Rhizomes were examined 12 and 19 months after planting, and average infestation per plot was rated on the same scale of 0 to 4.

Results are in Table 1, Experiment II. The following accessions, or cultivar groups, were either tolerant or resistant to *R. similis* (root lesion rating less than 1.00): *M. acuminata* subsp *malaccensis,* the 'Pisang Batuau' cultivar group, the 'Pisang Jari Buaya' group except for 'Morong Datu' and 'Pisang Rotan'; and 'Pisang Edor Kuda' and 'Pisang Lidi' cultivar groups. The other 42 accessions were susceptible (root lesion rating more than 1.00).

The second examination of the plants in Experiment II showed that two accessions 'Pisang Ekor Kuda' and 'Pisang Kermian' of the 'Pisang Lidi' group had higher root-lesion ratings (both 1.78) than earlier. Ratings of other cultivars were unchanged.

The results confirm that resistance or tolerance to *R. similis* is available in *M. acuminata,* as observed by Leach (2).

The greater susceptibility of the 'Cavendish' group is important because the 'Pisang Ambon' group, which is susceptible to Fusarium wilt, has been replaced commercially with wilt-resistant 'Cavendish' cultivars. The 'Cavendish' cultivars are uneconomic in some areas infested with *R. similis* unless nematicides are used, whereas the 'Pisang Ambon' group can be grown in such areas without nematicide treatments and still yield enough to be economic despite nematode damage.

LITERATURE CITED

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