

REACTION OF MACROPTILIUM ATROPURPUREUM AND RELATED SPECIES TO THREE DISEASES IN FLORIDA

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ABSTRACT

All *Macroptilium atropurpureum* lines tested were highly susceptible to *Uromyces appendiculatus* in greenhouse tests. The *M. lathyroides* and the three *M. bracteatum* lines in the test were resistant. Based on symptom development, a leaf mottling virus belonging to the PVY group was transmitted mechanically from Siratro to several but not all plants of the *M. atropurpureum* and two *M. bracteatum* lines. Plants of one *M. bracteatum* line and the *M. lathyroides* line were unaffected. Powdery mildew was present on all *Macroptilium* spp. except on one line of *M. bracteatum*.

INTRODUCTION

Macroptilium atropurpureum (D. C.) Urb. lines, especially the cultivar 'Siratro', are being grown and tested as forage plants in many parts of the tropics (Kretschmer 1972). There are about 80 ha of 'Siratro' in commercial plantings in Florida. Several *M. atropurpureum* and related species are being tested for forage use at the Agricultural Research Center, Fort Pierce (ARC-FP). Several diseases affect 'Siratro' and other *M. atropurpureum* lines in Florida (Sonoda 1975a, Sonoda 1975b, and Sonoda, Kretschmer and Brolmann 1971). These diseases include: foliar blight incited by *Rhizoctonia solani* Kuhn, sometimes causing heavy leaf loss during the wet summer months, rust incited by *Uromyces appendiculatus* Fries, endemic in Siratro plantings in Florida and severe during the early spring and late fall; powdery mildew incited by *Oidium* sp., a minor disease on Siratro in the field; *Cercospora* sp., so far found only at the ARC-FP; and a mosaic virus identified as belonging to the PVY group by D. E. Purcifull, University of Florida, Gainesville, and so far found only at the ARC-FP.

The following tests were conducted to determine the reaction of Siratro and other *M. atropurpureum* lines to three of these pathogens: *U. appendiculatus*, *Oidium* sp. and the mosaic virus.

MATERIALS AND METHODS

Twelve lots of seeds labelled as *M. atropurpureum* were obtained from various sources (see Results and Table 1). The seed was scarified with a razor blade and incubated on moistened filter paper in petri dishes at room temperature (24 to 28°C). Germinated seed was transferred to 295 ml styrofoam cups or wax coated paper cups filled with a commercial 1:1 shredded sphagnum peat moss and horticultural vermiculite mix plus nutrients. The plants were grown in the greenhouse until used.

Leaves of Siratro naturally infected with *U. appendiculatus* collected from two fields at the ARC-FP were placed in a flask with distilled water and shaken vigorously. The resulting uredospore suspension was filtered through four layers of cheesecloth giving a final concentration of about 1.5×10^4 uredospore/ml. Seven-week old plants were placed in plastic bags, two plants per bag, and sprayed with the spore suspension using a DeVilbiss atomizer. There were five single plants per replicate. The bags were sealed and kept on the laboratory floor for 48 hours (25 to 28°C). After removal from the bags the plants were placed in the greenhouse and disease severity was rated

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3 weeks after inoculation. A disease severity index was calculated by averaging the disease severity rating for the five plants per accession.

Leaves of Siratro exhibiting severe mottling and leaf deformation symptoms were obtained from a nine-year old planting at the ARC-FP. Inoculum was prepared by triturating the leaves in distilled water with a mortar and pestle. Four nine-week old plants of each of the 12 accessions were dusted with carborunum. Inoculum was applied to the plants in random order with a piece of cheesecloth. The plants were incubated overnight in plastic bags on the laboratory floor (24 to 28°C). After removal from the bags the plants were placed in the greenhouse and disease severity ratings were made two weeks after inoculation. A virus severity index was calculated by averaging the disease severity ratings of the four plants per accession.

Heavy natural infection of powdery mildew was obtained on most of the plants used in the preceding two tests in the greenhouse. A disease severity index was calculated by averaging the disease severity ratings of nine plants of each accession.

RESULTS

Upon growth and formation of flowering parts four of the 12 seed lots were found not to be *M. atropurpureum*: IRFL 910, 914, and 915 were found to be *M. bracteatum* (L.) Urb. and IRFL 1689 was found to be *M. lathyroides* (L.) Urb.

TABLE 1

Severity of Uromyces appendiculatus, a leaf mottling virus belonging to the PVY group and powdery mildew on accessions of Macropitilium spp. in greenhouse tests

Species	IRFL ¹	Source of seed ²	Disease Severity Index		
			Rust ³	Virus ⁴	Powdery mildew ⁵
<i>M. atropurpureum</i>	Siratro	Florida	4.0 a ⁶	3.0 ab ⁶	2.6 abcd ⁶
" "	911	Brazil	4.4 a	2.5 b	2.6 abcd
" "	912	"	4.4 a	4.0 a	1.8 cde
" "	913	"	4.4 a	4.0 a	2.2 abcde
" "	916	"	3.8 a	3.8 a	1.8 cde
" "	917	"	3.6 a	3.2 ab	1.2 de
" "	1055	Venezuela	3.6 a	1.2 c	3.2 abc
" "	1502	Mexico	3.8 a	1.2 c	2. bcde
<i>M. bracteatum</i>	910	Brazil	1.0 b	1.2 c	3.6 a
" "	914	"	1.0 b	1.0 c	2.6 abcd
" "	915	"	1.0 b	1.2 c	1.0 e
<i>M. lathyroides</i>	1689	Colombia	1.0 b	1.0 c	3.4 ab

¹ Agricultural Research Center, Fort Pierce accession number.

² Not necessarily country of origin of plant.

³ Rating system — 1 = no disease to 5 = severe infection.

⁴ Rating system — 1 = no symptoms to 5 = severe leaf malformation.

⁵ Rating system — 1 = no disease to 5 = severe infection.

⁶ Means in columns followed by the same letter are not different at the 5% level of significance (Duncan's Multiple Range Test).

The *U. appendiculatus* obtained, from Siratro, infected all individuals of the *M. atropurpureum* lines tested (Table 1), but was not pathogenic to the *M. lathyroides* or the three *M. bracteatum* lines. There was no significant difference in the incidence of the pathogen on *M. atropurpureum* lines. Old leaves and unexpanded leaves were less susceptible to *U. appendiculatus* than recently expanded leaves.

Individuals of all *M. atropurpureum* lines had symptoms of the virus (Table 1). However, several plants of IRFL 1055 and IRFL 1502 were free of virus symptom. One plant each of *M. bracteatum* IRFL 910 and IRFL 915 exhibited

light mottling symptoms. All plants of *M. bracteatum* IRFL 914 and *M. lathyroides* IRFL 1689 were resistant to the virus. The symptoms of the virus in the greenhouse on Siratro were similar to symptoms in the field.

Powdery mildew was observed on all accessions except IRFL 915, a *M. bracteatum* (Table 1). No effort was made to determine if more than one strain of powdery mildew was present.

DISCUSSION

None of the *M. atropurpureum* lines were resistant to *U. appendiculatus*. Although no work has been done to determine the effect of the rust on yield and quality of Siratro forage, the few farmers growing Siratro are satisfied with its performance, even in the presence of the rust. *U. appendiculatus* has not been reported on Siratro in Queensland.

The leaf mottling virus was found in the field in the spring of 1975 at the ARC-FP. A study in progress indicates that virus-infected Siratro plants produce about one half the dry weight yield of healthy plants (Sonoda, unpublished data). Since Siratro is a perennial plant and the virus is mechanically transmitted, it may be spread during harvesting or mowing operations. Studies are currently being conducted to determine whether the virus is transmitted by aphids. Some of the *M. atropurpureum* plants inoculated appeared to be tolerant to the virus. These plants may serve as the basis for breeding for resistance to this virus. A virus disease of Siratro (Passion fruit woodiness virus) incited by a member of the PVY group has been recorded in Queensland (Department of Primary Industries, Queensland, unpublished records).

Although powdery mildew can be severe in the greenhouse on Siratro, it is not an important disease in the field. Natural infection of powdery mildew has been reported in greenhouses in Queensland (Department of Primary Industries, Queensland, unpublished records).

Phaseolus vulgaris L., a species closely related to *M. atropurpureum*, is an important crop along the lower southeast coast of Florida. No work, however, has been done in Florida to determine if Siratro serves as an alternate host for diseases of bean.

The increasing use of Siratro in Florida and the current use of the plant in several areas of the tropics and subtropics makes it imperative that diseases of the plant be identified and evaluated and that possible sources of disease resistance or tolerance be found. Work must be conducted in each of the areas where the plant is being grown to determine if the diseases are of enough economic importance to warrant breeding for resistance.

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REFERENCES

- KRETSCHMER, A. E., JR. (1972)—Siratro (*Phaseolus atropurpureum* D.C.) a summer-growing perennial pasture legume for central and south Florida. Florida Agricultural Experiment Station Circular S-214. 21 pp.
- SONODA, R. M. (1975a)—Diseases of Siratro and other *Macropitium atropurpureum* selections in Florida. Fort Pierce ARC Research Report RL-1975-3.
- SONODA, R. M. (1975b)—Identifying and evaluating diseases of tropical and subtropical forage crops. *Proceedings of Soil and Crop Science Society of Florida* 34: 156-158.
- SONODA, R. M., KRETSCHMER, A. E. JR., and BROLMANN, J. B. (1971)—Web-blight of introduced forage and legumes in Florida. *Tropical Grasslands* 5: 105-107.

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