

The distribution of passionfruit ringspot virus in its main host plants in Ivory Coast

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Abstract

A field survey and testing of leaf samples have given an impression of the distribution of passionfruit ringspot virus in two *Adenia* and two *Passiflora* spp. in Ivory Coast. The data suggest that *Adenia* spp. are the original host plants of the virus. Introduction to Ivory Coast of the virus with *P. edulis* seems unlikely.

Since the *Adenia* spp. prefer forest and shrub vegetations and aphid flights are shorter in the dryer savannah areas of the North, the cultivated *P. edulis* has chances to remain healthy over a prolonged period of growth, which is excluded in the South of the country.

Introduction

Passionfruit ringspot virus (PRV) is prevalent in cultivated *Passiflora edulis* in the forest area of Ivory Coast and is spread by aphids (De Wijs, 1974a and 1974b). *Adenia lobata*, a member of the Passifloraceae and indigenous to West Africa (De Wilde, 1971), harbours the virus (De Wijs and Mobach, 1975). A survey has now been undertaken in Ivory Coast for the virus in wild Passifloraceae, especially *Adenia* spp.

Materials and methods

Sampling and storage of plant material. Leaves were usually taken from full-grown plants. The samples collected during field trips, were put in plastic bags and stored in an ice-cooled container. The presence or absence of symptoms, collecting site and name of the plant species, were noted.

Inoculations. Inoculum was prepared in the laboratory by grinding the leaves in 0.05 M potassium phosphate buffer, pH 7, containing 1% Na₂S₂O₃. Inoculations were done with an abrasive by rubbing the leaves of *Passiflora foetida* plants in active growth. Systemic symptoms of PRV, if present, were produced in about seven days.

Serology. An antiserum against PRV with a titre of 4096 was used for microprecipitin tests under paraffin oil in petri dishes. Crude plant sap to be tested was emulsified with an equal volume of chloroform for 30 min and clarified by low-speed centrifugation (10 min at 12,000

g). This procedure was excellent for leaves of *Passiflora* spp., but with leaves of *Adenia* spp. inspecific reactions were often obtained.

Results

Survey results are listed in Table 1 and the geographical distribution of virus and host plants is shown in Fig. 1. (placed at end of publication) At most sites several *P. edulis* plants, showing a uniform or no infection, were involved in testing but at sites no 6, 10, 13 and 24 single growing plants were tested. In the other cases single, or two or three plants growing together, were tested.

As seen from Table 1, symptomless infections were often present in *Adenia* spp., but never in *Passiflora* spp., which confirms earlier observations in laboratory transmission trials. A possible symptomless infection of the *P. edulis* plant at site no 24 is therefore very unlikely. However, unexplained remains the lack of virus recovery from the *P. edulis* plants at site no 8b. The two healthy *P. edulis* plants found at site no 6 and 24 were about one year old. The healthy plants at site 8b were certainly older but had evidently escaped infection although several diseased plants were present at a few hundreds of meters. The two healthy *P. edulis* plants at site no 10, growing more than one km apart, were more than a year old, while the little plantation at site no 9, planted in 1968, was still healthy four years later.

We searched intensively for *A. lobata* at site no 6, 7 and 8a, but in vain. This confirms the observation of De Wilde (1971) that *A. lobata* apparently prefers the coastal region although it is not totally absent further North. At site no 24, local farmers told that *A. lobata* was present in the region. Of the seven *Adenia* spp. reported to occur in Ivory Coast (De Wilde, 1971) we only found *A. lobata* and *A. cissampeloides*.

Fig. 1. Location of sites of host plants of passionfruit ringspot virus in Ivory Coast. Sites are listed with number, name and host plants in Table 1. Fig. 1. placed after 'references'.

Table 1. Sites of sampling (see also Fig. 1), plant species found, and results of tests for PRV by symptoms (S), inoculation (I), or serology (Se): + indicating the presence and - the absence of the virus, 'o' is indicating that no results are available.

Site	Location	Plant species	S	I	Se
1. Adiopodoumé,	ORSTOM*	<i>A. lobata</i>	+	+	+
1. Adiopodoumé,	ORSTOM*	<i>P. edulis</i>	+	+	+
1. Adiopodoumé,	IRCA*	<i>A. lobata</i>	+	+	o
2. Tiassalé,	SAFCO*	<i>A. lobata</i>	-	+	o
2. Tiassalé,	SAFCO*	<i>P. edulis</i>	+	+	+
2. Tiassalé,	SAFCO*	<i>P. foetida</i>	+	+	o
3. Azaguié,	IFAC*	<i>A. lobata</i>	+	+	+
3. Azaguié	IFAC*	<i>P. edulis</i>	+	+	+
3. Azaguié	IFAC*	<i>P. foetida</i>	+	+	+
4. Ono,	SALCI*	<i>P. edulis</i>	+	+	o
5. Diapé		<i>A. lobata</i>	-	+	+
5. Diapé		<i>P. foetida</i>	+	+	+
6. Abengourou,	SODEFEL*	<i>P. foetida</i>	+	+	+
6. Abengourou,		<i>P. foetida</i>	-	-	-

6. Abengourou,	city	<i>P. edulis</i>	+	+	+
6. Abengourou,		<i>P. edulis</i>	-	-	-
7. Yakassé agni		<i>P. edulis</i>	+	+	+
8. Bouaké	a, IRAT*	<i>P. edulis</i>	+	+	+
8. Bouaké	b, monastery	<i>P. edulis</i>	+	-	+
8. Bouaké		<i>P. edulis</i>	-	-	-
9. Ferkessédougou,	IRAT*	<i>P. edulis</i>	-	-	-
10. Korhogo		<i>P. edulis</i>	-	-	-
10. Korhogo		<i>P. edulis</i>	-	-	-
11. Lakota		<i>A. lobata</i>	+	+	0
12. Niambézario		<i>A. lobata</i>	+	+	0
13. Sassandra,	25 km North of	<i>P. edulis</i>	+	+	+
14. Louga		<i>A. lobata</i>	-	-	0
14. Louga		<i>P. edulis</i>	+	+	+
14. Louga		<i>P. foetida</i>	-	-	0
15. San Pedro,	15 km North of	<i>A. lobata</i>	-	+	0
15. San Pedro,		<i>A. cissampeloides</i>	-	-	0
16. Bokanidi		<i>A. lobata</i>	+	+	0
16. Bokanidi		<i>A. cissampeloides</i>	-	-	0
17. Nigbi II		<i>A. lobata</i>	+	+	0
18. Zadiégué		<i>P. eichleriana</i>	-	-	0
18. Zadiégué		<i>A. lobata</i>	-	-	0
18. Zadiégué		<i>A. cissampeloides</i>	-	+	0
19. Zakouéoua		<i>A. lobata</i>	+	+	0
20. Zoukougbeu		<i>A. lobata</i>	-	-	0
20. Zoukougbeu		<i>A. lobata</i>	-	-	0
21. Man,	Mont Tonkoui	<i>A. cissampeloides</i>	-	-	0
22. Vignifouta		<i>A. cissampeloides</i>	-	+	0
23. Lamto		<i>A. cissampeloides</i>	-	-	0
24. Péténou		<i>P. edulis</i>	-	0	0

Location abbreviations in Table 1.:

ORSTOM, Office de la Recherche Scientifique et Technique Outre Mer

IRCA, Institut de Recherche sur le Caoutchouc en Afrique

IFAC, Institut Français de Recherches Fruitières Outre Mer

SODEFEL, Société de Développement des Fruits et Légumes

IRAT, Institut de Recherches Agronomiques Tropicales et de Cultures Vivrières

SAFCO and SALCI are pineapple-processing works.

Tabel 1. Plaatsen van monsternamen (zie ook Fig. 1), gevonden plantesoorten en resultaten van de toetsingen op PRV aan de hand van symptomen (S), inoculatie (I), of serologie (Se): + geeft de aanwezigheid en - de afwezigheid van het virus aan. 'o' betekent: geen test doorgevoerd.

Discussion

P. edulis is normally propagated by seed, in Ivory Coast as well as in Australia and Kenya (McKnight, 1953; Nattrass, 1939). Since the virus is not seed-transmitted in *P. edulis* (De Wijs, 1974a), it seems very unlikely that PRV has been introduced with introduction of *P. edulis* in Ivory Coast. Although not all possible host plants of PRV, e.g. members of the Leguminosae, are surveyed, it is evident from this study that *Adenia* spp. are an important, if not the most important natural source of infection. They are even found diseased at remote places near recently constructed roads in scarcely inhabited areas (site no 15 and 16). This supports the conclusion that the virus most probably originates from the indigenous vegetation, especially but not exclusively from *Adenia* spp. That the virus may have been indigenous for a long time is further suggested by the fact that infections were often symptomless (Table 1).

Adenia spp. in Ivory Coast occur in primary and secondary rain forests, in forest edges, gallery forests and shrub vegetation, but *A. lobata* prefers the coastal region and is scarcer farther North (De Wilde, 1971). Aphid flights at site no 1 occur during most of the year (De Wijs, 1974b). This is quite normal for the entire forest area of Ivory Coast if the proper host plants for the aphids are present. *Eupatorium conyzoides*, infested with *Aphis spiraecola*, was also observed throughout the forest area, especially in more or less cultivated areas. In the savannah area, abundant flying aphids occur at the end of the wet season and during the first 1-2 months of the dry season as was demonstrated with yellow trays by ORSTOM entomologists near Bouaké, site no 8 (personal communication, 1972). Here, *A. spiraecola* was also one of the most common species. Short flight periods after short wet seasons were also reported in Kenya and Tanganyika by Eastop (1958).

The facts that *Adenia* spp., the virus source plant as well as the aphids, acting as vectors, are scarcer in the Northern savannah region of Ivory Coast, explains why at site no 9 and 10 old *P. edulis* plants could be found which were still healthy. These data also suggest that in this area passionfruit plants may remain healthy over a prolonged period of growth. This is absolutely impossible in the South.

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Samenvatting

De verspreiding van 'passionfruit ringspot virus' in zijn belangrijkste waardplanten in Ivoorkust

Uit veldwaarnemingen en onderzoek van bladmonsters in het laboratorium werd een indruk verkregen van de verspreiding van 'passionfruit ringspot virus' in *Adenia*- en *Passiflora*-soorten in Ivoorkust (Tabel 1 en Fig. 1). Deze gegevens doen veronderstellen dat *Adenia*-soorten de oorspronkelijke waardplanten van het virus zijn. Introductie van het virus met de invoer van *Passiflora edulis* lijkt onwaarschijnlijk. Daar *Adenia*-soorten gebonden zijn aan bos- en struikvegetaties en de bladluisevluchten in het drogere savannegebied van kortere duur zijn, kan de gekweekte *P. edulis* in het Zuiden niet, maar in het Noorden van Ivoorkust waarschijnlijk wel langere tijd gezond blijven.

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Fig.1. Geographical distribution of host plants of passionfruit ringspot virus in Ivory Coast. Sites are listed with number, name of location and host plants found in table 1. Spheres, ●, ○: *Adenia* species; triangles, ▲, △: *P. edulis*. Solid symbols: PRV detected; open symbols : PRV not detected.

Ecological aspects, simplified from GUILLAUMET - ADJANOHOON

- A Northern limit of tropical rain forest.
- B Northern limit of forest-savanna mosaic area. Savanna with *Brachiaria brachylopha*.
- C Northern limit of the area with shrub and tree savanna and savanna woodland of relatively moist type changing into a dry type North of this limit.
- r rivers.

Fig. 1. Ligging van de vindplaatsen van waardplanten van 'passionfruit ringspot virus' in Ivoorkust. De vindplaatsen zijn met nummer, naam en waardplanten vermeld in Tabel 1.

