Preliminary Observations on *Eumetopina* sp. (Hemiptera: Delphacidae) as a Vector of Ramu Stunt Disease of Sugarcane in Papua New Guinea

L. S. KUNIATA[1], G. R. YOUNG[2], E. PAIS[1], P. JONES[3] and H. NAGARAJA[1]

[1]Ramu Sugar Ltd., P.O. Box 2183, Lae, Papua New Guinea.
[2]27 Boyce St, Ryde, N.S.W. 2112.
[3]Plant Pathology Department, Crop Protection Division, Rothamsted Experiment Station, Harpendon, Herts AL5 2JQ, England.

ABSTRACT A pot trial conducted in 1992 at Ramu Sugar Ltd., Papua New Guinea, indicated that the leafhopper *Eumetopina* sp. was most effective in the transmission of Ramu stunt disease of sugarcane. Ramu stunt-like symptoms were first observed in test sugarcane plants 9-12 weeks after the introduction of infected insects.

Papua New Guinea (PNG) is a centre of diversity for the genus *Saccharum* (Daniels and Roach 1987). Some of the diseases and insect pests of commercial sugarcane (hybrids of *Saccharum* spp) at Ramu Sugar Limited (RSL) are still unknown to other sugar industries of the world (Kuniata and Sweet 1991). In 1986, a new disease was identified in sugarcane at RSL, reducing sugar production by at least 60% in the highly susceptible cultivar Ragnar which occupied 90% of the plantation (Eastwood 1990). The disease was given the working name Ramu stunt (Egan 1986; Waller *et al.* 1987).

The rapid spread of disease symptoms suggested the probability of an insect vector. Gibbs and Harrison (1976) pointed out that there are more than 60 species of planthoppers (Cicadellidae) and leafhoppers (Delphacidae) that are vectors of plant disease. *Eumetopina flavipes* Muir (Delphacidae), a potential vector of virus diseases (Bourke 1968), was abundant on commercial sugarcane and the wild canes *S. robustusm* and *S. spontaneum* in PNG. *Perkinsiella saccharicida* Kirkaldy (Delphacidae), a vector of Fiji disease (Pemberton 1950), was also present at very low densities.

Infection seemed lower in sugarcane plants treated with the insecticide carbofuran (Furadan 10G) than in untreated plants, further suggesting that an insect vector could be involved (Young, unpublished data). Initial screening of *Eumetopina* sp., *Lophops* sp. (Lophopidae), *Phaenacantha* sp. (Colobathristidae), *Saccharicoccus sacchari* (Cockerell) (Pseudococcidae) and *P. sacchardicida* bred from cv. Ragnar with Ramu stunt symptoms showed that only those test plants in field cages where *Eumetopina* sp. had been introduced showed Ramu stunt-like symptoms (Kuniata and Young, unpublished data). We therefore initiated disease transmission studies with *Eumetopina* sp. in an attempt to demonstrate its role in the transmission of Ramu stunt disease.

A disease transmission experiment with *Eumetopina* was commenced at the end of February 1992. Setts were collected from apparently healthy cane growing at Leron, approximately 80 km from the disease outbreak at RSL. Parent material had been imported from Australia in 1987, grown in quarantine at a Department of Agriculture and Livestock Station at Port Moresby, and further propagated at Leron. Single one-bud setts of cv. Ragnar were planted in plant-pots (200 mm dia. × 250 mm high) with 0.6 mm mesh aperture polyamide screens (220 mm dia. × 1.2 m high) held firmly around each pot with rubber tubing and supported by a metal frame. The treatments were nymphs, adults, and adults and nymphs, all bred on Ramu stunt diseased sugarcane plants plus adults and nymphs collected from wild cane *Saccharum robustum* and a control (no insects). The treatments were replicated twice. The control treatments were sprayed weekly with 0.2% a.i. chlorpyrifos to prevent insect contamination.

Insect releases commenced on 16 March when the shoots had only 1-2 leaves. Some pots did not receive their first batch of insects until mid-April. Total numbers of insects released per pot ranged from 110 to 336 over a period of 2 months. Plants were observed weekly for symptoms.

Ramu stunt symptoms first developed in early June, and continued to express in other shoots through June and July.

On 21 July, symptoms were present on over 90% of shoots in all three cages treated with insects bred on diseased cane (Table 1). No symptoms were observed in cages treated with insects from wild *S. robustum* or in the untreated controls. Data analysis using a 5 × 2 contingency table showed a highly significant greater proportion of test plants with Ramu stunt symptoms in cages with insects bred on diseased plants than those in the wild insect and control cages (Table 1). Ramu stunt symptoms continued to appear in ratoon cane in cages with infected cane. However, the number of shoots were not significantly different

to the wild insect and control cages. A higher proportion of shoots in ratoon cane from those cages with remmiscence of the disease were less than 10 mm in diameter compared to shoots from cages with wild insects and controls.

Table 1. Number/total sample and diameters/total sample of shoots from plant and ratoon cane with symptoms of Ramu stunt virus following the introduction of infected and wild *Eumetopina* sp.

	Plant Cane	Ratoon Cane	Ratoon shoots <10mm in diameter
Infected *Eumetopina*			
— nymphs	8/9	2/35	18/35
— adults	10/10	4/41	21/41
— nymphs & adults	7/8	3/35	14/35
Wild *Eumetopina*			
— nymphs & adults	0/4	0/6	0/6
Control (no insects)	0/5	0/19	4/19
χ^2 (df = 4)	27.7 P<0.001	2.7 N.S.	10.5 P<0.05

Ramu stunt symptoms were expressed 9-12 weeks after the nymphs were introduced to the cages. Symptom expression in cages with other treatments took more than 18-20 weeks.

Collections made at RSL in 1981 showed *E. flavipes* was the most common leafhopper on commercial sugarcane (R. G. Fennah, pers. comm.). Other collections in PNG revealed at least nine species of *Eumetopina* from sugarcane (Wilson 1987). Recent collections from commercial and wild canes at RSL were sent to Dr M. R. Wilson (IIE-London) for identification. However, he could not confirm the species as *E. flavipes*, highlighting the need for a taxonomic revision of this genus.

Pemberton's (1934) review of insects which could constitute pests in Hawaii listed *E. flavipes* as one which could be potentially serious. Bourke (1968) listed *Eumetopina* sp. as an insect which was likely to be of importance to commercial sugarcane production in PNG. Chandler and Croft (1986) reported *E. flavipes* from most of the Torres Strait Islands, and considered it a potential pest to the Queensland sugarcane industry. The results from our trial demonstrate that *Eumetopina* sp. is an effective vector of Ramu stunt a potentially serious disease of sugarcane in PNG.

Acknowledgments

We thank Dr D. Eastwood (RSL) and Mr B. T. Egan (BSES, Australia) for comments on the manuscript. The *Eumetopina* species were identified by Drs R. G. Fennah and M. R. Wilson (IIE, British Museum, U.K.). We also acknowledge suggestions and comments from Mr K. J. Chandler and Dr R. Magarey (both BSES) on these trials and assistance received from various RSL Agronomy Section employees. Mrs B. Taramaku typed the manuscript.

References

BOURKE, T. V. (1969). Further records of insects collected from *Saccharum officinarum* in the Territory of Papua New Guinea with notes on their potential as pest species. Proc. int. Soc. sugar cane Technol. 13: 1418-1423.

CHANDLER, K. J. and CROFT, B. J. (1986). Quarantine significance of pests and diseases of sugarcane on Torres Strait Islands. Proc. Aust. Soc. sugar cane Technol. 1986: 129-133.

DANIELS, J. and ROACH, B. T. (1987). Taxonomy and Evolution. *In* Heinz, D. J. (ed.). Sugarcane improvement through breeding, pp. 7-84. Elsevier: Amsterdam.

EASTWOOD, D. (1990). Ramu stunt disease, development and consequence at Ramu Sugar Ltd. Sugar Cane 1990 (2): 15-19.

EGAN, B. T. (1986). New disease problems appear in Papua New Guinea. BSES Bull. 16: 8-10.

GIBBS, A. and HARRISON, B. (1976). Plant virology, the principles. Edward Arnold: London.

KUNIATA, L. S. and SWEET, C. P. M. (1991). Pests of sugarcane and their management. *In* Kumar, R. (ed.). Proceedings of a Seminar on Pests and Diseases of Food Crops—Urgent Problems and Practical Solutions, pp. 26-40. Department of Agriculture and Livestock: Konedobu.

PEMBERTON, C. E. (1934). Some serious insect pests of sugarcane and the importance of their exclusion from Hawaii. Reports of the Association of Hawaii Sugarcane Technologist, 13th Annual Meeting.

PEMBERTON, C. E. (1950). Notes on the life history of the sugarcane leaf hopper. Hawaii. Plters Rec. 53: 205-210.

WALLER, J. M., EGAN, B. T. and EASTWOOD, D. (1987). Ramu stunt, an important new sugarcane disease in Papua New Guinea. Trop. Pest Mgmt 33: 347-349.

WILSON, M. R. (1987). A faunistic review of Auchenorrhyncha on sugarcane. Proc. 6th Auche. Meeting, Turin, Italy. pp. 485-492.

(Accepted 30 October 1993)