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LITERATURE REVIEW ON *SOGATODES (SOGATA)*  
*ORYZICOLA* (MUIR) AND *SOGATODES CUBANUS*  
(CRAWFORD) (HOMOPTERA: DELPHACIDAE) VECTORS  
OF HOJA BLANCA VIRUS (HBV) OF RICE

By

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SUMMARY

*Sogatodes (Sogata) oryzicola* (Muir) and *Sogatodes cubanus* (Crawford) are vectors of hoja blanca virus (HBV) on rice in South America. *S. oryzicola* is also important in Central America and Cuba. Both pests have recently been collected in Trinidad. These rice delphacids have been observed to cause severe stunting and reduced tillering of young plants. *Elenchus* has been recorded as a parasite in Colombia. A number of varieties resistant to hoja blanca virus have been recorded. The developmental stage of the rice seedling is of importance in resistance studies. A number of insecticides have been used for control of *Sogatodes*. Hoja blanca virus has a deleterious effect on its vector. Alternate host plants of *Sogatodes* have been identified.

Introduction

*Sogatodes (Sogata) oryzicola* (Muir) (Homoptera: Delphacidae) is a pest of rice in Central and South America and in Cuba. The insect was reported in the rice-growing area of the Southeastern United States from 1957 through 1959 and from 1962 through 1964. However, it has not been able to establish itself permanently on the North American continent, Showers and Everett (1967), Casanova (1970), Acuna Gale et al (1966), Herold et al (1968), Ishihara & Nasu (1966).

Reddy (1968) listed *Sogatodes cubanus* (Crawford) as a vector of hoja blanca disease in South America. Both pests have recently been collected in Trinidad.

Tremendous populations of rice delphacids may develop in rice, and young plants may be severely stunted and show reduced tillering because of plant hopper feeding. The primary interest in these insects is their position as known vectors of hoja blanca virus (HBV) of rice, Acuna Gale (1966).

#### Parasites

Vargas and Sanchez (1985) listed *Elenchus* as a parasite of *S. oryzae* and *S. cubanus* and other Homoptera on rice varieties IR-22 and CICA 6 in Colombia. The authors stated that the parasite afforded little control of the pests. Its possible role as a biological control agent is therefore questionable.

#### Resistant Varieties

A number of rice varieties resistant to hoja blanca virus have been recorded: Anonymous (1984), Galvez (1968), Granados et al (1968) and Trujillo (1969) demonstrated that varietal resistance studies to hoja blanca on rice in Venezuela can be done efficiently by using plants with three leaves. By the use of Trujillo's method reproducible results were obtained. In screening studies for obtaining resistant varieties, symptoms of the hoja blanca disease were observed to develop 35 days after the rice had been sown. Studies done by Lamey et al (1968) in Louisiana, U.S.A. also suggested that the development stage of the rice seedlings was of importance in resistance studies. Resistance was not expressed in extremely young plants. Galvez (1968) therefore used plants beyond the six-leaf stage to determine resistance susceptibility to HBV.

#### Insecticidal Control

Garcia et al (1983) tested the incompatibility of the herbicide propanil with the pyrethroid insecticides Bayroid and Ripcord in greenhouse experiments in Cuba. Mixtures of 61 propanil with 2.51 methyl parathion, 11 Bayroid cyfluthrin or 11 Ripcord (cypermethrin)/ha were composed for control of *Sogatodes oryzae* and for phytotoxicity to rice. The order of phytotoxicity of the mixtures was methyl parathion > cypermethrin > cyfluthrin. The insecticidal effects of methyl parathion and cypermethrin in mixtures were slightly reduced, but cyfluthrin was affected.

Trujillo (1968) investigated the effect of certain insecticides to rice on the survival of *Sogatodes (Sogata) oryzae* (Muir) and on the incidence of the hoja blanca disease, which it transmits.

Rice seedlings of a susceptible variety were sprayed when 2-3 leaves had developed, and in the greenhouse viruliferous individuals of *S. oryzae* were confined singly on the plants 1, 3 or 9 days after spraying. Mortality was recorded daily for six days. The sprays applied were 0.2% of a product containing 50% phosphamidon (Dimecron), 0.2% dimethoate, 0.2% methyl - demethon (Metasystox) and 0.3% malathion. All gave 100% mortality of *S. oryzae* within six days, but the intervals required for the attainment of complete mortality were 0-3, 3-6 and 4-6 days for insects placed on the seedlings 1, 3 or 9 days respectively, after treatments, and the percentages of plants that showed symptoms of hoja blanca were 5-15, 15-45 and 25-60 for the three groups respectively.

#### Effect of virus on vectors

Jennings and Pineda (1971) showed that hoja blanca virus had a deleterious effect on its vector *S. oryzae* in Colombia. Infected females laid only one third as many eggs as virus-free ones, and there was a reduction in the number of eggs that hatched and the number of nymphs that completed their development. The fertility of both sexes was reduced by the virus, as was the duration of adult life. The results therefore explained the incidence of vectors among wild populations of *S. oryzae* and suggest explanations for the apparent cyclical nature of the occurrence of the disease.

Showers and Everett (1967) carried out greenhouse experiments to determine whether transovarial acquisition of hoja blanca virus (HBV) by progeny of the rice delphacid, *Sogata oryzae* (Muir), existed. Progeny of reciprocal crosses of HBV-transmitting (TT) males to nontransmitting (NT) females or NT males to TT females transmitted HBV to healthy rice seedlings without having fed on a diseased plant. Transmission of HBV by progeny of nontransmitting female suggests that the expression of HBV disease symptoms on rice plants is not completely adequate as an indicator of HBV within a particular individual insect. Analysis of variance showed that a significant difference exists in adult longevity between progeny of TT males crossed with NT females ( $21.3 \pm 0.94$  days) and NT males crossed with TT females ( $18.1 \pm 0.88$  days). HBV acquired transovarially may therefore reduce the number of days the adult insect lives.

Acuna Gale (1966) demonstrated the transmission of hoja blanca virus by *Sogatodes oryzae* (Muir). Reddy (1968) states that *S. oryzae* and its less important relative *S. cubanus* (Crawford) are responsible for the transmission of the disease in the Western hemisphere and South America respectively.

Galvez (1968) states that the conditions for transmission include an acquisition period of 15 min., a long incubation period of the virus in the insect (31 days), and a transmission period of 30 min. Galvez (1968) noted that the virus was passed back and forth from rice to rice, wheat, barley, oats, rye and *Echinochloa colinum* by *Sogatodes oryzicola*. Likewise, HBV was transmitted by *S. cubanus* from rice to rice and from *E. colinum* to rice.

Acuna Gale showed that only 7–12% of the population of *S. oryzicola* were able to transmit HBV; the remainder were injurious only on account of mechanical damage. An acquisition feeding period of two days was found to be necessary and there was an incubation period in the vector of 9–11 days. Symptoms appeared 9–18 days after infective Delphacids fed on healthy plants for a period of two days.

#### Alternate Host Plants

When Adults of *Sogatodes (Sogata) cubanus* (Crawford), a vector of the causal virus of hoja blanca were confined on several species of Gramineae other than rice, oviposition occurred only on *Panicum purpurascens* and *Echinochloa polystachya* and development was completed only on the latter Granados et al (1966).

Eggs of *S. (S.) oryzicola*, vector of HBV were laid only on *P. maximum* and *Pennisetum ciliare* out of six grasses offered. Development did not continue beyond the first nymphal instar on *P. maximum* but was completed on *Pennisetum ciliare*, Granados et al (1966).

#### BIBLIOGRAPHY

- ANONYMOUS (1984). A summary of major achievements during the period 1977–1983. C.I.A.T. report.
- CASSANOVA, P. (1970). *Sogata oryzicola* (Muir) (Delphacidae: Homopt), a new pest of rice in Peru. *Revista Peruana de Entomologia Agrícola* 13 (1) 96–98.
- ACUNA GALE, J., RAMOS-LEDON, L. & LOPEZ CARDET, Y. (1966). *Sogata oryzicola* (Muir), vector of the hoja blanca virus disease of rice in Cuba. *Agrotecnica Cuba* 4, No. 2, pp. 8–15.
- GALVEZ, G.E. (1968) Transmission studies of the hoja blanca virus with high active, virus-free colonies of *Sogatodes oryzicola*. *Phytopathology* 58, No. 6, pp. 818–821.
- GARCIA, R.A., ZAMORA, N. CORONA, R. GUTIERREZ, L. GOMEZ, C. (1983). Determination of incompatibility of the herbicide propanil with the pyrethroid insecticides Baytroid and Ripcord. *Ciencia y Técnica en la Agricultura, Arroz* 6 (1): 103–130.

- GRANADOS, R.G. & ORTEGA, C.A. (1966). Food-plants of the vectors of the virus causing hoja blanca. Transmission tests and the reaction of different rice varieties to the virus. *Agricultura tec. Mex.* 11 No. 6 pp. 276–284.
- HEROLD, F., TRUJILLO, G. & MUNZ, K. (1968). Viruslike particles related to hoja blanca disease of rice (found in rice plants infected by means of *Sogatodes (Sogata) oryzicola* (Muir) in Venezuela). *Phytopathology* 58 No.4 pp. 546–547.
- ISHIHARA, T. & NASU, S. (1966). Leafhopper — transmitting (sic) plant virus in Japan and adjacent countries. Papers presented at the divisional meeting on plant protection, the Eleventh Pacific Science Congress, Tokyo.
- JENNINGS, P.R. & PINEDA, T.A. (1971). The effect of the hoja blanca virus on its insect vector. *Phytopathology* 61 (2): 142–143.
- LAMEY, H.A., EVERETT, T.R. & BRISTER, C.D. (1968). Influence of developmental stage of rice plant on susceptibility to hoja blanca virus. *Phytopathology* 58 No. 8, pp. 1168–1170.
- REDDY, D.B. (1968). The symposium on virus diseases of rice. *Inf. lett. FAO Pl. Prot. Comm. S.E. Asia* No. 55, 7 pp.
- SHOWERS, W.B. & EVERETT, T.R. (1967). Transovarial acquisition of hoja blanca virus by the rice Delphacids. *J. Econ. Ent.* 60 No. 3; pp. 757–760.
- TRUJILLO, G. (1968). The relation between the application of insecticides and transmission of hoja blanca disease of rice by *Sogatodes oryzicola*. *Agronomia trop.* 18 No. 4: pp. 441–448.
- TRUJILLO, G. (1969). Obtaining lines of *S. oryzicola* with a high transmission rate and the possibility of selecting varieties of rice resistant to hoja blanca. *Agronomia trop.* 19 No. 4; pp. 309–317.
- \*\*VARGAS, M.L. & SANCHEZ, G.G. (1985). Natural control of some pests of the rice varieties Ir-22 and CICA-6. *Revista Colombiana de Entomología* 9 (1–4): pp. 50–54.
- \*\*Important reference for Biological control of rice pests.