

SPECIES AND PEST STATUS OF COCCIDS INFESTING SUGARCANE - A REVIEW

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ABSTRACT

About 40 species of scale insects belonging to four different families, Acleridae, Asterolecaniidae, Coccidae and Diaspididae have been recorded in sugarcane. Two species viz., *Aulacaspis tegalensis* Zeh. and *Melanaspis glomerata* G. are of economic importance in Mauritius and India, respectively. Among the forty spp. ten species of coccids infest sugarcane leaves while the remaining species chiefly colonise the stem. The different species of sugarcane coccids, their occurrence, distribution worldwide along with alternate host, and the black sugarcane insect *Melanaspis glomerata* attaining major pest status since 1951, its occurrence and distribution are reviewed.

Sugarcane scale insects

Among the different pests attacking sugarcane, coccids play a vital role in hampering the cane development and growth by appearing from the midstage of crop and persisting upto harvest. Nearly thirty spp. have been recorded to invade the stem and colonise profusely in the internodal region under the leaf sheath.

The different species of sugarcane coccids, their occurrence, distribution in the world along with alternate hosts are furnished by Box (1953), Rao and Sankaran (1969), Williams (1970, 1980), Sakunthala (1983), Rao and Rao (1984), Varshney (1985), Easwaramoorthy and Kurup (1986) and Jayanthi *et al* (1985) (Table 1). Of the 40 species of scale insects belonging to Acleridae, Asterolecaniidae, Coccidae and Diaspididae, most of them have been recorded as sporadic pests with negligible importance. But *Aulacaspis tegalensis* Zeh. was reported to occupy a major pest status in Mauritius, East Africa and South East Asia. *Aulacaspis madiunensis* Zeh. and *Aspidiella sacchari* Cockerell are other species to have assumed importance occasionally (Rao and Sankaran, 1969).

Coccids infesting leaves and roots

Among the different species,

Acanthomytilus sacchari Hall and *Greenaspis decurvata* Green (Easwaramoorthy and Kurup, 1986); *Aclerda japonica* var *inermis* (Ramakrishna Ayyar, 1936); *Ceroplastes actiniformis* G. (Mohammad Ali, 1962); *C. saccharifolii* (Zehntner 1897); *Duplachionaspis stanatophori* Cooley (Balachowsky, 1954); *Pulvinaria elongata* Newstead (Bodkin, 1917); *P. elongata* var *durbanensis* de Lotto (de Lotto, 1964); *P. iceryi* Signoret (Mament, 1958; Williams, 1960) and *P. longisana* (de Lotto, 1964) infest sugarcane leaves while only one species *Lecanaspis sacchari* (Takahashi) colonises the stem.

Scale species in India

Scale species occurring in India are *Ceroplastes actiniformis* (G.), *Pulvinaria elongata* (News.), *Saccharolecanium krugeri* (G.), *Aulacaspis madiunensis* (Zeh), *Odonaspis saccharicaulis* (Zeh), *Aspidiella sacchari* (Cockerell), *Duplachionaspis divergens* (G.), *Temnaspidotus kellyi* (Brain), *Marsipococcus marsupiale*, *Greenaspis decurvata* (G.), *Acanthomytilus sacchari* (Hall), *Aclerda japonica* (News.), *A. japonica* var *inermis* (G.), and *A. distorta* (G.) (Pruthi and Rao, 1942; Rao and Sankaran, 1969; Sakunthala, 1983; Krishnamoorthy, 1996; Ananthanarayana unpubl., Nandagopal unpubl.). Among these, *A. sacchari*, *C. actiniformis*, *G. decurvata* and

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Table 1. List of coccids records on sugarcane and their distribution worldwide.

Species	Distribution	Alternate hosts
Family : Aclerididae		
<i>Aclerda campinensis</i> Hempel	Brazil	
<i>A. distorta</i> Green	India	Bamboo in Ceylon
<i>A. holci</i> Teague	Louisiana	
<i>A. takahashi</i> kuwana	Brazil, Formosa, Mauritius, Reunion	
<i>A. tokionis</i> (Cockerell)	India, Pakistan	First record on bamboo in Japan
(= <i>A. japonica</i> Newstead)		
<i>A. tokionis</i> var. <i>inermis</i> Green	India, Pakistan	First record on bamboo in Japan
<i>A. sacchari</i> Teague	Brazil, Cuba, Louisiana, Philippines, Puerto Rico	
Family : Asterolecaniidae		
<i>Bambusaspis</i> (<i>Asterolecanium</i>) <i>bambusae</i> (Boisduval)	Madeira	
Family : Coccidae		
<i>Ceroplastes actiniformis</i> G.	India	
<i>Coccus sinensis</i> Walker	China	
<i>Coccus takanoi</i> Takahashi	Formosa	
<i>Coccus</i> sp.	Natal	
<i>Lecanium guerinii</i> Signoret	Mauritius	
<i>Marsipococcus marsupiale</i>	India	
<i>Saccharolecanium</i> (<i>Lecanium</i>) <i>krugeri</i> Zehntner	Java, India	
<i>Pulvinaria elongata</i> Newstead	Barbados, Guyana, Grenada, Jamaica	
<i>P. iceryi</i> Signoret	China, Florida, Georgia, New Guinea, Mauritius, Reunion, Queensland, India	
<i>P. longisana</i> de Lotto	Kenya	
<i>P. saccharia</i> de Lotto	Natal	
<i>P. elongata</i> var. <i>durbanensis</i> Green		
Family Diaspididae		
<i>Acanthomytilus sacchari</i> (Hall)	Africa, Egypt, India	
<i>Aspidiella sacchari</i> (Cockerell)	Antigua, Barbados, Ceylon, Cuba, Guyana, Jamaica, Java, Mauritius, Puerto Rico, St. croix, St. kitts, Trinida, Venezuela	
<i>Aspidiotous destructor</i> Signoret	Natal, Virgin Island	Primarily pest of Coconut
<i>Aulacaspis madiunensis</i>	Australia, Java, China, India, Formosa	Occurs on <i>Erianthus arundinaceum</i> Retz. in Ceylon and on <i>Ipomoea</i> sp. in India
<i>Aulacaspis</i> sp. nr. <i>madiunensis</i> (Zehntner)	Japan	
<i>A. tegalensis</i> (Zehntner)	Java, Kenya, Formosa, Malaya, Philippines, Reunion, Seychelles, Sumatra, Tanzania, Uganda	Occurs on <i>E. arundinaceum</i> in Java
<i>Chionaspis saccharifolii</i> Zehntner	Java, Philippines	
<i>C. depressa</i> Zehntner	Philippines	Occurs on <i>E. ciliates</i> (Anders.) in Java
<i>Chionaspis</i> sp.	Java	
<i>Diaspis</i> (= <i>Aulacaspis</i> <i>rutherfordii</i> Morrison)	New Guinea	
<i>Duplachionaspis stanotophri</i> (Cooley)	Formosa, Hongkong, Egypt	
<i>D. divergens</i> (Green)	India	
<i>Greenaspis decurvata</i>	India	

(Contd.)

Species	Distribution	Alternate hosts
<i>Hemiberlesia cyanophylli</i> (Signoret)	Hawaii	Cosmopolitan species polyphagous
<i>H. lataniae</i> (Signoret)	Egypt	Cosmopolitan species polyphagous
<i>Lecanaspis sacchari</i> Takahashi	Formosa	Occurs on <i>Miscanthus</i> sp.
<i>Melanaspis glomerata</i> (Green)	India	Occurs on grasses also
<i>Aspidiotus</i> (= <i>Targionia</i>) <i>glomeratus</i>		
<i>M. saccharicola</i> (<i>Sonidiella saccharicola</i>)	Brazil	
<i>Odonaspis saccharicaulis</i> Zehntner	Java, India, Indonesia, Philippines	Recorded in bamboo (Java) and in <i>E. arundinaceum</i> , grasses (Indonesia)
<i>O. janeirensis</i> (Hempel)	Brazil	Occurs in other grasses
<i>Brainaspis</i> (<i>Temnaspidotus</i>) <i>kellyi</i> Brain	India	Occurs in grasses in South Africa

P. elongata occur on leaves while the remaining species infest the stalk. Of the different species, *M. glomerata* (G.), the native armoured scale is economically important.

Systematic position of *Melanaspis glomerata* (G.)

This black sugarcane scale insect was first described by Green (1903) as *Aspidiotus glomeratus*. Box (1953) placed *Aonidiella glomerata* (Green) and Agarwala (1956) redescribed the species and placed it under the genus *Melanaspis* and since then it is referred to as *Melanaspis glomerata*. Gupta (1957) also grouped *Aspidiotus glomeratus* (Green) and *Targionia glomeratus* (Green) as synonyms.

Occurrence and distribution

Melanaspis glomerata G. was first recorded in 1903 in India by Watt Geo and sent to Green for identification. Ramachandran and Ramakrishnan (1934) reported the occurrence of *Melanaspis* along with four other coccids. Occasionally its attack was severe in parts of North India and Coimbatore (Pruthi and Rao, 1942). It was considered to be a minor pest till 1951, and later reported in alarming proportions by Rao (1951) at Coimbatore. Subsequently, several workers have reported the occurrence of this insect in a serious form in Bihar (Agarwala 1956; Gupta, 1957; Khanna, 1957; Ali, 1962), in Pugalur (Narayanaswamy *et al.*, 1957), Pettavaithalai (Trichy district) (Raja Rao and Bhaskar Rao, 1960), Tanjore, Coimbatore and

Madurai districts (Kalra and David, 1966) of Tamil Nadu; Gujarat (Tembhekar, 1964; Kalra, 1967); Maharashtra (Phadke *et al.*, 1969; Patil *et al.*, 1979); Delhi (Sunil Kumar *et al.*, 1972), Nizamabad and coastal districts of Andhra Pradesh (Avasthy, 1967; Prasada Rao, 1972; Seshagiri Rao, 1975); Uttar Pradesh (Gupta *et al.*, 1976); Madhya Pradesh (Kalra, 1965; Kalra and Mehrotra 1967; Pawar *et al.*, 1981), Karnataka (Thontadarya and Govindan, 1976); Murshirabad and Nadia districts in West Bengal (Misra *et al.*, 1980) and Haryana (Jagadish Prasad *et al.*, 1981). After assuming major pest status, this pest has spread and invaded new areas of the country irrespective of the prevailing biotic and abiotic factors.

It is adapted to a wide range of weather conditions. The cryptic habit of the pest in multiplying profusely under the leaf stem and its heavy migration due to carry over of the pest unwittingly through seed and by wind and water are the key factors for large scale incidence. Under favourable conditions incidence sometimes even reaches cent per cent.

Damage

Reduction in germination of buds, inhibition of cane growth, reduction in cane yield upto 63.4% (Tembhekar, 1965), in juice upto 41.1% (Prabhakara Rao *et al.*, 1976), in commercial cane sugar by 35% (Tembhekar, 1965) and also losses in jaggery production have been recorded.

Present status of coccids

Four species of scale insects viz., *Melanaspis glomerata* (G), *Marsipococcus marsupiale*, *Aulacaspis madiunensis* (Zeh) and *Aclerda japonica* (Zeh) were recorded from five sugar factory areas in Tamil Nadu surveyed by Krishnamoorthy (1996). Of them the occurrence of *M. glomerata* alone was extensive and widespread to the extent of 41.2 - 89.6 % on cane basis and 25.3 - 52.2 % on nodal basis. It was evident from the survey that it continued to occur on sugarcane as a major pest for nearly 4-½ decades ever since it's assuming to a pest level as reported by Rao (1951). Similar studies made earlier by Jayanthi (1991) revealed the occurrence of six species viz., *M. glomerata* (G), *Aspidiella sacchari* (Zeh), *Aulacaspis madiunensis* (Zeh), *Odonaspis saccharicaulis* (Zeh), *Saccharolecanium krugeri* (Zeh) and *Greenaspis decurvata* (G) with *M. glomerata* alone dominating to the extent of 91.2 % in Vellore sugar areas.

Aspidiella sacchari was present in all the locations surveyed, at high levels of incidence (60-70%). (Jayanthi, 1991). By virtue of its abundance in the cane cultivated in sandy/sandyloam soils and in ratoons as compared to heavy soils and in plant crops, this species is next in the order of importance to *M. glomerata* (G.)

Aulacaspis madiunensis has been reported as economically important in its native Queensland (Rao and Sankaran, 1969). Its occurrence was noted in a severe form in CoC 671 in about two hectares in 1985 (David, unpubl.). Earlier, Rao and Rao (1984) recorded this species in Andhra Pradesh on Co 62175. Later it was reported to occur in low levels in Kothari sugars and Madurantakam sugar area by Jayanthi (1991). Subsequently, 4.8% incidence on cane basis and 2.1 % intensity on nodal basis were recorded in Trichy, Pugalur and Mohanur areas of Tamil

Nadu (Krishnamoorthy, 1996). It was also found to attack alternate hosts like *Erianthus* sp which is commonly used as fencing material and in *Saccharum spontaneum*.

Marsipococcus marsupiale continued to persist but at low levels ever since their first record in the state by Sakuntahala (1983). Incidence to the tune of 26.9 % with an intensity of 12.5 % in CoC 671 was found at ninth month onwards due to favourable conditions prevailing during grand growth phase for effective colonization. (Krishnamoorthy, 1996).

Aclerda japonica was recorded as early as 1942 in the Pusa collections in Bihar. Low incidence to a level of 9.3 % with 5.8 % intensity was recorded in five sugar factory areas (Krishnamoorthy, 1996).

Saccharolecanium krugeri reported from Trichy district of Tamil Nadu during 1975 (Williams, 1980), was again recorded from the same district in 1991 in negligible proportions which indicates its status as a sporadic pest (Jayanthi, 1991).

G. decurvata was found to be widespread in Madurai (19%), South Arcot (6.3%), Chengalpattu (< 2%), and North Arcot districts (< 2%) (Jayanthi, 1991). As a leaf feeding species, this pest can cause severe yellowing and subsequent drying, if present in high population densities.

Infestation of *Odonaspis saccharicaulis* (Zeh.) was recorded in only Chengalpattu district to a low level (< 5%) (Jayanthi, 1991). This pest also has an alternative host, *Erianthus* sp. as in the case of *A. madiunensis*.

Apart from *M. glomerata* the other coccids discussed above need periodic surveys in different cane growing areas so as to monitor pest build-up. In addition to monitoring, suitable cultural measures like detrashing, maintenance of good crop, prevention of indiscriminate transport of infested setts,

discouraging continuous ratoons, are to be epidemic proportions as had happened in the adopted in future lest they may assume case of *M. glomerata* during 1950's.

REFERENCES

- Agarwala, R.A. (1956). Annual Rept 1955-56, Sugarcane Breeding Institute, Coimbatore pp. 95-105.
- Ali, S.M. (1962). *Indian J. Sugarcane Res. Dev.*, 6: 72-75.
- Avasthy, P.N. (1967). *PANS*, 13: 111-117.
- Balachowsky, A. (1954). *Les Cochenilles palacrtinques de la Eriba Diaspidini*, Paris, 450 pp
- Bodkin, G.E. (1917). *Bull. Ent. Res.*, 8: 103-109.
- Box H.E. (1953). *List of Sugarcane Insects. Commonwealth Inst. Ent.*, London, 101.
- de Lotto, G. (1964). *Bull. Br. Mus. Nat. Hist. (Ent.)*, London. 14: 341-397.
- Easwaramoorthy, S. and Kurup, N.K. (1986). In: *Sugarcane Entomology in India*. Sugarcane Breeding Institute, Coimbatore. 233-258.
- Green, E.E. (1903). *Indian Mus. Notes*. 5: 93-103.
- Gupta B.D. (1957). *Indian J. Sug. Cane Res. Dev.* 11(1-4): 10.
- Gupta, K.M. et al. (1976). *Indian Sug.*, 26: 505-506.
- Jagadish Prasad, A.D. et al. (1981). *Co-op. Sug.* 13: 185-187.
- Jayanthi, R. (1991). Ph.D thesis, Sugarcane Breeding Institute, Coimbatore.
- Jayanthi, R. et al. (1995). *Indian J. Agric. Res.*, 29: 53-63.
- Kalra, A.N. (1965). *Sug. Herald*. 8(1): 10-1.
- Kalra, A.N. (1967). *Span* 10: 177-179.
- Kalra, A.N. and David, H. (1966). *Indian Sug.* 15(12): 769-773.
- Kalra, A.N. and Mehrotra, A.K. (1967). *Indian Sug.* 17: 555-556.
- Khanna, K.L. (1957). *Indian J. Sug. Cane Res. Dev.*, 11: 19-22.
- Krishnamoorthy, S.V. (1996). Ph.D thesis, TNAU, Coimbatore.
- Mament, R. (1958). *Proc. R. Ent. Soc.*, London (B). 27: 65-75.
- Misra, M.P. et al. (1980). *Indian Sug. Crops J.* 7 (4) : 113.
- Mohammed Ali, S. (1962). *Indian J. Sug. Cane Res.*, 6: 72-75.
- Narayanaswamy, P.M. et al. (1957). *Indian J. Sug. Cane Res. Dev.*, 3: 105-106.
- Patil, A.S. et al. (1979). *Proc. A. Conv. Sug. Cane Tech. Assoc.*, India. 43: 45-49.
- Pawar, A.D. et al. (1981). *Indian Sug.*, 30: 681-684.
- Phadke, G.V. et al. (1969). *Proc. A. Conv. Deccan Sug. Tech. Assoc.*, India. 23: 54-65.
- Prasada Rao, K.K. (1972). *Co-op. Sugar*, 3 : 205.
- Pruthi, H.S. and Rao, V.P. (1942). *Indian J. Ent.*, 4 : 87
- Raja Rao, S.A. and Bhaskara Rao, U.K. (1960). *Proc. bienn. Conf. Sugarcane Res. Dev. Wkrs.*, 4: 521-527.
- Ramachandran, S. and Ramakrishnan, T.V. (1934). *Imp. Council Agric. Res. Bull.*, 4: 111.
- Ramakrishna Ayyar, T.V. (1936). *J. Bombay Nat. Hist. Soc.*, 34: 148.
- Rao, G.N. (1951). *Proc. conf. Sug. Cane Res. and Dev. Wkrs.* India. 1 (2) :7-11
- Rao, A.V. and Rao, T.R. (1984). *Indian J. Agric. Sci.*, 54: 512.
- Rao, V.P. and Sankaran, T. (1969). In: *Pests of sugarcane.* (Williams, J.R, et al., eds) Elsevier Publ. Co., Amsterdam. pp. 325-340.
- Sakunthala, V.A. (1983). *Madras Agric. J.* 70: 545-547.
- Seshagiri Rao, C. (1975). *Co-op Sug.*, 6: 567-569.
- Sunil Kumar, S.S. and Misra and Prasad, S.K. (1972). *Indian Sug.* 21: 695.
- Tombhekar, V.V. (1964). *Proc. Bien. Conf. Sugarcane Res. Dev. Wkrs.*, 5: 552.
- Thontadarya, T.S. and Govindan, R. (1976). *Proc. All India Sem. Sugarcane Scale Insect*, Nidadavole. pp. 42-43.
- Varshney, R.K. (1985). *Oriental Insects*. 19: 1-10.
- Williams, J.R. (1960). *Ann. Rep. Maurit. Sug. Ind. Res. Inst.*, pp 61-66.
- Williams, J.R. (1970). *Bull. Ent. Res.*, 60: 61-95.
- Williams, D.J. (1980). *Bull. Ent. Res.*, 70: 435-437.
- Zehntner, L. (1897). *Proefstn Oost. Java (n.s.)* 37: 35-40