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Scales and Mites in Vegetative Plant Material Imported from Different Countries

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Abstract: Quarantine examination of 3,028 exotic vegetative samples of various crops during 2023 and 2024 revealed infestation of insect and mites in 193 samples. These included five species viz., *Aceria tulipae* in *Allium sativum* from Kazakhstan and USA, *Amphitetranychus viennensis* in *Pyrus communis* from USA, *Polyphagotarsonemus latus* in *Persea americana* from Vietnam and *Oligonychus peruvianus* in *P. americana* from USA and also four species of scale insects, *Aonidiella orientalis* in *Vitis vinifera* from Brazil, *Aspidiotus nerii* in cuttings of *P. communis* from USA, *Chrysomphalus dictyospermi* and *Hemiberlesia lataniae* in *P. americana* from USA and *Parasaissetia nigra* in *P. americana* from Vietnam. All the infested samples were salvaged using suitable pesticidal dip treatment.

Keywords: Quarantine, germplasm, vegetative, scales, mites, salvage.

INTRODUCTION

The import of small samples of plant/ planting material meant for research in various crop improvement program is a potential and inadvertent source of introducing exotic pests into new areas which may cause severe threat to crop production and economy of a nation. There are several glaring examples of pests introduced along with imports, which have resulted in enormous crop losses over the past several decades such as fluted scale *(Icerya purchasi*), a serious pest of citrus and native of Australia was introduced into India before 1928 from Sri Lanka probably on *Acacia* sp. which later became a serious pest on citrus in south India. Another example is that of San José scale (*Quadraspidiotus perniciosus*), a pest of apple introduced into India in 1930s which causes enormous losses in apple orchards in Himachal Pradesh.

Several insects and mites of economic significance have been intercepted at ICAR-National Bureau of Plant Genetic Resources (ICAR-NBPGR) from time to time, many of which have yet not been reported from India. ICAR-NBPGR is the nodal agency to undertake the quarantine processing of germplasm including transgenic planting material introduced into the country for research purposes. Few of the exotic pests intercepted over the years include *Acanthoscelides obtectus* intercepted in *Cajanus cajan* introduced from Brazil and Colombia; *Anthonomus grandis* in *Gossypium* spp. from USA; *Ephestia elutella* in Macadonia (nuts) and *Vigna* sp. from USA; *Pachymerus lacerdae* in nuts of *Orbynya phalerata* from Brazil; Quadrastichodella eucalyptii in Eucalyptus spp. from Australia (Gupta et al., 2005).

MATERIALS AND METHODS

During the years 2023 and 2024, a total of 3,028 samples of exotic vegetative planting material of various crops were processed for quarantine. These samples included rooted plants, cuttings, rhizomes, suckers, bulbs, nuts and tissue culture tubes of different crops. The various vegetative material imported include bulbs of Allium sativum, cuttings of *Carya illinoensis, Fragaria ananossa, Malus* spp., *Olea europaea, Persia americana, Prunus armeniaca, Theobroma cacao* and *Vitis vinifera* rooted plants of *Phoenix dactylifera* and sets of *Saccharum officinarum*. All the

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planting material were inspected by naked eye or with the help of magnifiers for the detection of external symptoms of damage i.e. holes, rotting, swelling, deformity, etc. or presence of dead or alive insects/ mites, eggs/ egg shells, immature stages, exuviae or excreta thereof. The insects were retrieved from the material in water or 70% alcohol. The mites and scales thus retrieved were stained, slide mounted and identified on the basis of identification keys (Keifer 1938, Pritchard and Baker, 1955, Williams and Watson, 1990) and reference collection at ICAR-NBPGR.

All the infested samples were salvaged using pesticidal dip/ spray treatment. Curative dip/ spray treatment with an acaricide, Kelthane @ 0.035% and insecticide, Malathion @ 0.05% or a combination of both was given to 193 samples of infested material comprising *Allium sativum*, *Persia americana*, *Pyrus communis*, *Saccharum officinarum*, and *Vitis vinifera* and 2,835 samples were given prophylactic treatment with Malathion and Kelthane as above.

RESULTS AND DISCUSSION

The quarantine processing of 3,028 samples of imported germplasm revealed infestation in 193 samples and the pests intercepted during quarantine processing are presented in Table 1. *Aceria tulipae* intercepted in *Allium sativum* is a mite belonging to family Eriophytidae; a pest restricted to genus associated with bulbs of liliaceous plants and is reported from several countries in Europe, South Asia including India, northern Africa, Central America and USA. Eggs, nymphs and adults survive in the bulbs for long period both in soil and in storage, and are the main source of infestation and spread (Wahba et al., 1984). Estimates of economic losses caused by *A. tulipae* are few, but reductions in yield of 23% reported in garlic due to mite infestation (Larrain, 1986) *Amphitetranychus viennensis* intercepted in *Pyrus communis* from USA is generally considered as a pest of Rosaceae and is an important pest of apple, peach, pear, apricot, plum, hawthorn, cherry, sweet cherry and raspberry in China, Georgia, Japan, Russia, Turkey, Ukraine and other European countries. Adult females are ovoid, dark-red, diapausing individuals are bright red, approximately 0.36 mm in width, 0.54-0.59 mm in length. Adult males are smaller, approximately 0.31 mm in length, with a hysterosoma that narrows posteriorly. *A. viennensis* may cause serious damage in dry years (Chepurnaya and Myalova, 1981), and mite damage affects the photosynthesis of the plants consequently resulting in reduction in fruit size and weight, but not in the number of fruits produced (Cai et al., 1992). It is widely distributed in several countries of Europe and Asia but not yet reported from India and is on the quarantine pest list in Australia and in USA.

Mites of the genus *Oligonychus* intercepted on *Saccharum officinarum* from USA are recognized by having a well developed empodial claw, with six to twelve hairs proximoventrally and by the absence of the caudal pair of para-anal setae, while *O. peruvianus* intercepted on *Persea americana* from USA is easily recognized by the short, lanceolate and nearly nude body setae on dorsum (Pritchard and Baker, 1955). *O. peruvianus* occurs along with other spider mites, and is known to cause serious injury to host plants in South America. It is known to be present in few countries in Central and South America and the Caribbean, Mexico, Spain and USA and is yet not reported from India. The fourth mite species Polyphagotarsonemus latus intercepted in *Persia americana* from Vietnam is a polyphagous species and has been found on hosts species belonging to over 60 different plant families worldwide (Gerson, 1992). Adult females of P. latus are small (200 μm) and have an unornamented dorsal shield. Dorsal idiosomal setae are short. Males have four pairs of setae on the dorsum of propodosoma with tibia and tarsus IV fused bearing a button-like claw. The mite is a serious pest of tea, chilli pepper and aubergines in China (Li et al., 1985). It was reported to have destroyed 50% of the bean crop in New Guinea and of the lemon crop in parts of South Africa. It is a pest of cotton in tropical Africa and Brazil. Damage by P. latus was 100% on sweet peppers (*Capsicum* sp.) grown in a screen house in Taiwan, while aubergines, Datura, chilli pepper and Gerbera were severely damaged (Liu et al., 1991).

Aonidiella orientalis intercepted on *Vitis vinifera* from Brazil is an armoured scale with adults covered with a scale or cover that is morphologically separate from the body. The adult female is less strongly reniform than typical for its genus, with less developed prosomatic lobes. It is a tropical and subtropical species with a wide distribution,

including the West Indies, Middle East, India, East Africa and South Africa, southern Asia and northern Australia (CAB International 2007). It has been accidentally distributed worldwide on host plants and also occurs in greenhouses in temperate areas. It is highly polyphagous, can attack almost any host except conifers and is an economic pest of citrus, *Ficus*, mango, papaya, banana and other fruits; palm trees, including coconut, arecanut and tea (Rajagopal and Krishnamoorthy, 1996). It is also a serious pest on coconut in Malaysia and Sri Lanka, mango in the Philippines and Israel, papaya in Malaysia and Australia, and guava in India (Rosen, 1990).

Aspidiotus nerii in cuttings of *Pyrus communis* from USA is also an armoured scale with female grey-white, circular, slightly convex and 2 mm long with almost central yellow exuviae. Adults remain under the scale armour and are yellow, broadly ovoid or circular and membranous except for parts of the pygidium. *A. nerii* is highly polyphagous and has been recorded on hundreds of host species in over 100 plant families (Beardsley and Gonzalez, 1975). Although the pest is of worldwide distribution, it is considered to be native to the Mediterranean area and is usually only a minor or non-economic pest on most of its hosts (DeBach and Rosen, 1991). However, it is particularly important where aesthetic value of the crop is high where its presence makes them unmarketable.

Chrysomphalus dictyospermi and *Hemiberlesia lataniae* intercepted on *Persea americana* from USA are both highly polyphagous scales recorded on hosts belonging to >70 plant families. *C. dictyospermi* can be easily confused with *A. aurantii*, however, adult female *C. dictyospermi* can be distinguished from *A. aurantii* in slide mounts because they possess perivulvar pores, and lack prosomal lobes expanded postero-laterally to partially enclose the pygidium (the latter is a prominent feature of mature female *A. aurantii*). The species is probably native to southern China; widespread in tropical and subtropical regions, and occur in glasshouse in temperate areas (Gill, 1997). It is distributed predominantly in Turkey, Syria, and Iran. *H. lataniae* was first described from a very popular ornamental palm distributed worldwide and is considered to be a serious pest in many areas of the world, including Israel, Palearctic Regions, the former USSR and USA (Miller and Davidson, 1990). Both the scales are important from quarantine viewpoint as they get transported and introduced to new countries often via importation of infested plant material, especially ornamental plants.

Parasaissetia nigra intercepted in *Persea americana* having the diagnostic characters of adults - presence of dorsal reticulations and cylindrical or capitate dorsal setae; the absence of tibio-tarsal scleroses and free tibio-tarsal articulation; and the absence of large discal setae from the anal plates. *P. nigra* is polyphagous and has been recorded on 240 hosts from 81 plant families, especially field crops, fruit trees and ornamental plants of tropical origin. *P. nigra* probably originated in Africa but is presently occurring all over the world. It is speculated that its geographical range in temperate areas is likely to increase as a result of global warming. It is widely distributed in Africa, India, Sri Lanka, Malaysia, Indonesia, Central and South America; rubber trees in Sri Lanka, India, Malaysia, Indonesia and South America; cotton in Africa, Sri Lanka, India, China, Taiwan, Japan, South Pacific islands, Hawaii and South America; sandal trees in India; cherimoya in Sri Lanka, Australia and the West Indies; guava in Taiwan, Australia, USA and West Indies; mango in South Africa, Hawaii, California and Florida; and papaya in Australia, USA and West Indies. However, major outbreaks and serious damage in these countries have been avoided mainly as a result of natural enemy activity.

The importance of plant quarantine is clearly indicated by the interception of few economically important quarantine pests not yet reported from India. Although some of the pests intercepted are already known to occur in the country, they are important from quarantine point of view because of their economic impacts and the increasing number of strains of species being reported (Wadhi, 1980). Moreover, due to the perishable nature of the vegetatively propagated material they are immediately planted in the field which increases the chances of associated pests finding suitable conditions for survival and establishment. Their repeated interception year after year warrants proper detection and salvaging of infested material for pest-free release of vegetative germplasm for crop improvement program.

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Table 1: Scale Insects and Mites Intercepted in the Exotic Vegetative Germplasm during 2023-24

Pest	*Host*	*Samples Received (Infested Samples)*	*Source/ Country*
Mites			
Aceria tulipae	*Allium sativum*	201 (22)	Kazakhstan, USA
Amphitetranychus viennensis	*Pyrus communis*	48 (10)	USA
Oligonychus peruvianus	*Persea americana*	82 (3)	USA
Oligonychus spp.	*Saccharum officinarum*	3 (1)	USA
Polyphagotarsonemus latus	*Persia americana*	21 (21)	Vietnam
Scale insects			
Aonidiella orientalis	*Vitis vinifera*	64 (8)	Brazil
Aspidiotus nerii	*Pyrus communis*	48 (12)	USA
Chrysomphalus dictyospermi	*Persia americana*	84 (10)	USA
Hemiberlesia lataniae	*Persia americana*	30 (2)	USA
Parasaissetia nigra	*Persia americana*	21 (12)	Vietnam

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