How to Manage Mealybugs in greenhouse

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Mealybugs (Hemiptera: Pseudococcidae), also known as woolly aphid in some parts of the world, are members of the unarmored scale insects distributed throughout the world, infesting a wide range of crops and ornamentals. They cause direct damage to their host plants by feeding on the most nutritious plant saps, and some mealybug species are also known to transfer plant pathogens while others produce toxic materials during feeding, causing deformations and stunted growth. Mealybugs feed on all parts of their host plant but prefer tender leaves and stems. They secrete copious quantities of honeydew on which a black sooty mould fungus grow, affecting the photosynthetic potential of the plant and making the product unsuitable for export markets. It is not easy to control them with insecticides since their body is covered with thick layer of mealy cover, in some species reaching up to 0.5 mm thick.

Mealybugs are distributed in all zoogeographical regions of the world, although species composition and richness vary greatly among regions. They are particularly abundant in regions with moist, warm tropical climates. The authors own recent observations revealed that the population of the citrus mealybug, Planococcus citri (Risso), has increased to a noticeable status in greenhouses. Although a proper survey is yet to be made, the observation so far indicated that P. citri is the only species that has increased to economically damaging status in most farms under IPM system in Kenya and Ethiopia.

Figure1:
Crawlers and first-instar nymphs of P. citri emerging from ovisacs

Figure 2.
Adult female P. citri,

Figure 3.
Adult male P. citri

Planococcus citri is one of the most ubiquitous of all mealybug species recorded so far. It is a cosmopolitan pest attacking a wide range of crops and ornamentals. It has been recorded as a serious pest in Africa, Australia, the Mediterranean region, North, Central and South America. It has the ability to dominate and displace other mealybug species inhibiting the same ecological niches due to its high competitive behavior and fecundity, i.e. 'competitive displacement'.

No part of the host plant is immune to mealybug attack although they prefer the young and tender tissues at the growing point. Planococcus citri causes yellowing of leaves by sucking plant saps when its population reaches high density. This leads to stunted growth, sticky appearance with distorted stem and growth point deformation, shriveling and in some cases die back of stems. Leaves are reduced in size, discolored, wilted and easily drop-off prematurely. Weakened plants often succumb to fungi and other microbial attack. If its population reaches extremely high level, the whole or part of the host plant could die. P. citri is also known as a vector of grapevine leaf-roll virus. The large quantity of honeydew it secretes serves as a medium of growth for a black sooty mould fungus. This fungus not only reduces the photosynthetic potential of the crop/plant but is also unsightly and significantly reduces the marketability of the produce. This has a serious implication in cut flowers where the aesthetic value is what customers pay for.

Immediately after hatching, the bright-yellow crawlers move around for some time until they detect a suitable site for settlement. They seek succulent parts such as tender leaves, stems and new flushes. Mealybug populations persist for long inside curled leaves, cracks, and bending. The lower leaf surfaces are usually infested when high population exists. Areas below the petioles of the leaves, between twigs and main stems as well as between branches are preferred settlement sites. In addition to the general mealybug damage, P. citri also causes development of intense red colorations, a symptom referred to as stippling or hyper-pigmentation.

Control

Physical

When mealybug population is not high one can: Rub off gently from leaves and stems; Knock off with a brisk of water spray; Wash off carefully with soapy water; one tablespoon of liquid dish detergent in one quarter of water is a good ratio; Pick off with tweezers; Dab off each insect with alcohol-soaked cotton swab.

Cultural

Examine/quarantine new plants before planting them in greenhouses. All stages of mealybugs are visible to the naked eyes or else one can use handles to check for their presence before introducing new plants to either new greenhouses or to the existing plantations; If severe infestation is detected, prune or cut the parts heavily infested; Keep good farm hygiene to deny mealybugs of hiding spots; Watch wind-direction and speed as eggs and crawlers can be carried over several kilometers when heavy breeze is present; Use

sticky-card traps both for monitoring and reducing mealybug populations; Select as much as possible resistant plant cultivars from the onset.

Biological

Figure 4. Anagyrus sp.

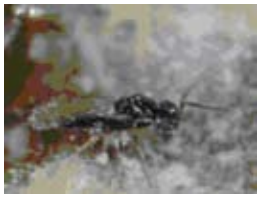

Figure 5. Coccidoxenoides peregrines

Parasitoids such as Anagyrus sp., Coccidoxenoides peregrines and Leptomastix dactylopii are among the most common and abundant species that check mealybug populations (see Fig. 4 & 5). While Anagyrus sp. usually attacks the more mature stages of mealybugs, C. peregrines usually parasitize the young immature stages. Thus, a simultaneous release of these two species could be effective against all stages of mealybugs as both parasitoids can co-exist very well.

Predators such as Nephus sp. (e.g. N. bineavatus, N. reunioni), Exochomus flavipes, Cryptolaemus montrouzieri and Dactylopius sp. (Fig. 6 & 7) are but a few effective bio-control agents. Commercial application of C. montrouzieri in many fruit and vegetable growing parts of the world has been a common practice for long. Cecidomyiid flies prey on mealybug eggs and small larvae. These predators plus lacewings, minute pirate bugs, and spiders are among the important predator complexes that can keep mealybug populations in check.

Entomopathogenic or insect-killing fungus, Beauvaria bassiana (Botanigard), is commercially available bio-pesticide (or bio-control agent) for the control of mealybugs.

Chemical

Figure 6. ryptolaemus montrouzieri

Figure 7. Nephus bineavatus

It is important that chemical spray depends on scouting results so that the most vulnerable stages, i.e. first instar and early second instars, are targeted. Once they start producing mealy cover, it becomes difficult to control them with chemicals. However, chemicals can be mixed with wetting agent, penetrants or stickers to enhance their penetration through the wax layer. Insecticides with contact or systemic action are often used. It is also customary to mix chemicals with oil to increase chemical penetrations as well as to suffocate the mealybugs. A number of both conventional insecticides as well as a few insect growth regulators (IGR) are effective in subduing the population of mealybugs if used at the right time. Chemical application should be repeated as necessary based on scouting results so that the susceptible young stages could be exposed to the chemicals when they are in large numbers. It is essential to rotate among insecticides with different modes of action to help delay the development of resistance.

Monitoring

Early infestations can be easily overlooked due to the mealybug's tendency to hide in protected locations. Mealybugs can be difficult to find if populations are low. Thus regular scouting is of paramount importance to detect early infestations. It is advisable to look for white flecks or cottony residues along the leaf midribs, on leaf or stem axils and on the underside of the leaves. If larger plants are staked, mealybugs hide beneath the tape on the stake that is used to secure the plant. Adult females may crawl off the plants and be found on or in brick crevices and under benches where they lay eggs. Honeydew, sooty mold and the presence of ants may also be an indication of a mealybug infestation.

Integrated Management

It is always a good practice to integrate available control options in order to manage the population of mealybugs while maintaining good agricultural practices. Integration of physical, cultural, biological, monitoring, ant-control and chemical control options is plausible. Integration of different methods in an effective and ecologically sound manner has been practiced against a wide range of mealybug species in fruits and vegetable crops in different parts of the world. This could be easily adopted to greenhouse ornamentals where conditions for integration are even more suitable than field conditions.

Conclusions

The increase of P. citri to economically damaging level especially in greenhouse ornamentals under IPM system is not an unexpected scenario since the restrictions on the use of miticides and insecticides in such greenhouses create conducive environment for the mealybugs to flourish. Thus, it is essential to further investigate the species composition of the mealybugs involved, their biology and ecology under the prevailing conditions. As mealybugs influence the aesthetic value of greenhouse ornamentals, they bring about a significant reduction in marketability of cut-flowers. Therefore, the development of a proper management tool/s needs no less emphasis. As mealybugs in general are amenable to biological control and IMP system, more works need to be done to develop such effective means.

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