

Unveiling the secrets of the green peach aphid: Insights into *Myzus Persicae* (Sulzer) (Insecta: Hemiptera: Aphididae)

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Abstract

Myzus Persicae, commonly known as the Green Peach Aphid, is a noteworthy and significant pest that affects crops on a Multi-National level. This research paper will analyse and examine the biology, ecology and the various management strategies of *Myzus Persicae* to provide an overview and further insight for productive and constructive pest control measures. Some biological characteristics of *Myzus Persicae* are — its capability of reproducing at a rapid rate, its ability to transfer plant viruses, and insecticide resistance development. For implementing precise and targeted control strategies, its necessary to understand its life cycle, feeding routines, and host plant preferences.

Ecological factors that influence *Myzus Persicae* populations include — temperature, humidity, and host plant availability. Interactions with genuine enemies such as predators and parasitoids play a pivotal role in maintaining and balancing aphid populations and can be integrated with pest management programs.

Management of *Myzus Persicae* relies on a mixture of cultural, biological, and chemical control methods. These include crop rotation, habitat manipulation, use of resistant plant species, addition of natural enemies, and prudent application of insecticides.

Future research directions should focus on understanding the mechanisms underlying insecticide resistance because upon discovering the mechanism, new and efficient insecticides for controlling aphids can be introduced. Exploring alternative control methods, and developing sustainable strategies to alleviate the impact of *Myzus Persicae* on agricultural production.

By integrating knowledge of biology with effective management practices, it is possible to minimize its impact on crops while promoting sustainable agriculture.

Keywords: *Myzus Persicae*, Pest, insecticide, agriculture

Introduction

Green peach aphid is found in the entire world, this would include different areas in North America. It is regarded as a pest mainly due to its ability to transmission of plant viruses.

In addition, it attacks the plants which exist in the field, it actually infest ornamental plants and vegetables that grow in greenhouse. It has allowed higher level of surviving in different areas. It favored transportation over plant material. The time, when it is young, the plant infest in the greenhouse. It then transplants into various other fields, these fields would not only get inoculated with the aphids but there can be introduction of insecticide resistance. These aphids get transmitted to longer distance through storms or wind.

About the Life Cycle

Life cycle varies in a considerable manner, which depends upon the way cold winters affect. Certain information is disclosed in the previous research conducted by Van Emden *et al.* (1969) [32]. There could be rapid development in this that ranges between 10-12 days to completely generate. Wherever it is suitable, the host plants which could not persist, they could persist in egg stage on *Prunus* spp. Different generations except autumn generation culmination leads to egg production are non-sexual i.e. parthenogenetic. In Florida, the population cycles continue on the annual plants.



Fig 1: “Colony of the green peach aphid, *Myzus persicae* (Sulzer), with several life stages. Credits: Ken Gray, Oregon State University”

Eggs

Eggs would get deposit on the *Prunus* spp. tree. The eggs mentioned in this have a size, wherein length is around 0.6 mm and width of 0.3 mm. Such an egg is green or sometimes yellow in the initial phase, then later they turn into black colour. Mortality in stage of eggs is sometimes bit high.

Nymphs

Nymphs are greenish in the initial phase, but very soon they turn yellowish in colour, which greatly resembles viviparous (nymph-producing, parthenogenetic) adults. Birth is given to offspring between 6-17 days after their birth and they are having an average age of around 10.8 days at their first

birth. There is a variation in the reproduction length in a considerable manner, but having an average of 14.8 days. The length of life is 23 days on an average, such a condition applies when it is under cage and predators get excluded.

Daily reproduction rate has an average of 1.6 nymphs per each female. More number of generation have been observed in an annual manner in different studies have been determined as 20 – 21 which depends on every year.



Fig 2: Nymph of the green peach aphid. Credits: Ken Gray, Oregon State University

Adults

The number of generations which might occur on the Prunus during spring could be till 8 generations, but as and when aphid densities increase then winged forms get produced, which slowly disperses into the summer hosts. The winged (alate) aphid has black thorax and head, and yellowish green

abdomen having larger dark patch. These measure in length as 1.8 - 2.1 mm. The winged green peaches aphid make an attempt towards colonizing of the plants which are available. They many a times deposit few young ones and after a certain period, they take a flight.



Fig 3: Female adult green peach aphid, with immatures. Credits: USDA



Fig 4: Adult green peach aphid, *Myzus persicae* (Sulzer). Credits: USDA

Wingless aphid are greenish or sometimes yellowish in their color. Their length is between 1.7- 2.0 mm. There could be presence of lateral and medial green stripe. The cornicles in

length are longer moderately and even swollen at times in an uneven manner along the length and this matches their body color. Appendages are quite pale. The reproduction rate has a positive correlation with the temperature, with a developmental threshold estimate around 4.3°C. Dispersants produce sometimes more than or at times less than around 20 offspring and they are found to be wingless in general. Such a cycle in general gets repeated when weather is favorable. Sometimes in Florida, aphid development slows down in a great manner during winters. During autumn, the response changes to a day in length or temperature, there is production of winged female and male that are produced which later disperses for searching Prunus. In this case, timing also plays a very important role, since foliage on Prunus host is said to be physiologically in nature as their leaves could begin senesce. The population which is focused on production of eggs is said to be tolerant during cold weathers and they deposit eggs on the Prunus. Anholocyclic population would remain in an active form

annually by feeding in winter on the growing of weeds adjacently to drainage ditches.

Host Plants

Green peach aphid feed on the host plant in more than 40 such plant families. As such, there is only viviparous summer stage which feeds so widely; oviparous winter stages could be found to be restrictive as per choice in diet. Based on temperate latitude, the hosts which are overwintering or primary are the trees of genus *Prunus*. Vegetables which are reported for supporting green peach aphid would include artichoke, bean, potato, cantaloupe, broccoli, corn, watermelon, okra, spinach, cabbage, parsnip, parsley, watercress, fennel, asparagus, lettuce, kale, turnip, beets, pea, tomato, cauliflower, pepper, squash, eggplant, celery, radish, mustard, kohlrabi, carrot, cucumber and Brussels sprouts. Field crops like sugar beet, sunflower and tobacco have been attacked. Many flower crop and some

other ornamental plant is also suitable for “green peach aphid development”.

Broadleaf weed is at times found to be quite suitable for the green peach aphid, hence leads to creation of pest problems which are being faced in crops nearby. Tamaki (1975) as an example have estimated that a large number of aphid per acre are produced on weeds.

Damage

Green peach aphid could achieve higher density over the tissues of young plants which could cause water stress, reduction in growth rate and wilting of plants. Infestation of prolonged aphid could lead to reduction in the yield of root and foliage crops appreciably. As per Arkansas, sometimes there are milder winters and this could lead to survival of the green peach aphids based on spinach and this would lead to problems of contamination (McLeod 1991) [17]. Green peach aphids do not seem to have been producing higher amount of honey dew.



Fig 5: Damage to leaves caused by the green peach aphid, *Myzus persicae* (Sulzer). Credits: Ken Gray, Oregon State University



Fig 6: Damage to leaves caused by the green peach aphid, *Myzus persicae* (Sulzer). More than one stage in the life cycle of the aphid shown. Credits: Ken Gray, Oregon State University

More damage which could be caused by the green peach aphids happens when plant viruses get transmitted. Indeed aphids have been considered as a very important plant virus in the entire world. Nymphs as well as adults are found to be capable of transmission of viruses (Namba and Sylvester 1981) [19]. Both are persistent virus, that move through aphid’s feeding secretion and other viruses which are non-persistent, that are only said to be temporary contaminant of aphid’s mouthparts which gets transmitted effectively. As

per the information by Kennedy *et al.* (1962) [12] have listed more than 100 virus which get transmitted through various species. There is a possibility that certain diseases which are damaging particularly potato virus Y to the Solanaceae and potato leaf roll virus, beet yellow viruses and beet western yellow viruses to Chenopodiaceae.

Natural Enemies

There are many natural enemies which are referred to as lady beetles, entomopathogenic fungi (Entomophthorales), parasitic wasp (Hymenoptera: Braconidae), (Neuroptera: Chrysopidae) and lacewings, (van Emden *et al.*, 1969) [32] have provided longer list based about certain organism. Many of them actually which are referred to as general predators that move quite free amongst the green peach aphids, some other aphids and some other kind of insects. In certain cases natural enemies have been influenced by host plant, environmental condition and crop cultural practice. The Green peach aphids and considered to be like many other kind of aphids and they may be predatory or cannibalistic; though such a behavior actually occurs under conditions which are stressful and this factor is not considered important for the population regulation. Quantitative data has been lacking to influence of natural enemies. It is has been reported that weather contributes towards significant changes in the aphid numbers. Ephemeral nature of aphid’s infestation in different crops has been believed that it would be preventing beneficial

organism from being consistently locating aphid as well as reproducing timely. There has been stronger association which is followed by appearance of entomopathogenic fungi, wasp parasitoids or lady beetles. As an example, green peach aphids infest the spring-harvested crop of spinach in crops in Oklahoma and Arkansas.

Diseases like epizootic have often occurred quite late for keeping aphids from attainment of high numbers. Fungus-infected aphid have remained attached to the foliage, which provide serious contaminants of the spinach foliage (McLeod *et al.* 1991) ^[17]. There are different studies which have been excluded selectively or kill beneficial organisms are demonstrating potential which is explosive reproductive of the aphids in absence of the biological control agent and have demonstrated the value in reduction of potential damages. In the greenhouse crops, where environmental conditions exist, the parasitoid, pathogen and predator

densities could get manipulated, wherein the biological suppression has been more consistent and effective.

Integrating chemicals with the natural enemies have offered promise to enhance protection from damage caused to aphids. Shean & Cranshaw (1991) ^[25] have demonstrated that the *Diaeretiella rapae* (McIntosh) (Hymenoptera: Braconidae) and *Aphelinus semiflavus* Howard (Hymenoptera: Encyrtidae) have a significant different in susceptibility towards insecticides which depends on chemical evaluation. Also, such parasitoids are in mummy stage, have been lesser susceptible towards insecticide toxicity as compared to green peach aphids. The usage of insecticides in crops have been quite disruptive to the parasitoids than the aphids which would lead to large aphid population. Sub-lethal dose of certain insecticides has increased the aphid's reproduction (Lowery and Sears 1986) ^[14].



Fig 7: A *Aphelinus* sp. (Hymenoptera: Encyrtidae) parasitizing a green peach aphid. Credits: Ken Gray, Oregon State University

Despite beneficial nature of such biotic agents, there is a chance that the virus diseases could be transmitted effectively by the lower aphid densities. Based on susceptibility of the crops to virus diseases which are aphid-borne, natural enemies could be destined probably to relative ineffectiveness in prevention of damages.

Management

There are different options in management of green peach aphids which are quite similar to the procedure which has been discussed in relation to aphid, i.e. *Aphis gossypii* Glover.

Sampling

Day-degree model makes use of developmental threshold which is 4°C and it could be used for predicting various phenological event like egg hatching and also alate aphids immigration. Yellow trap mainly waterpan traps have been used mainly to monitor population. Sampling plan which is sequential plan for the green peaches aphids on potato has been developed by previous researches.

Insecticides

Despite having different options in a potential manner, there are many producers who have been dependent on the insecticides to suppress abundance of green peach aphids. Application of insecticides systematically have been popular especially at the time of planting, most of them have provided long-lasting protection as against aphids population which is build-up during susceptible and critical stages of growth in plants and some of them have provided

protection for a period of 3 months. Even the systemic insecticides, that would kill aphids which feed under leaf when there is application of insecticides to upper surface and they have been lesser effective at cooler temperatures (McLeod 1991) ^[17].

Insecticides when being used unnecessarily and excessively need to be avoided. In some cases, the insecticides could be used for certain reasons, and it could lead to more damage or could even lead to outbreak of green peach aphids.

Biological Control

Mackauer (1968) ^[16] has indicated that green peach aphids develop at quite low temperature as compared to parasitoids, wasps are quite beneficial only in benign climate or where the temperature can be easily controlled, and this is possible in some greenhouses only. There is considerable success through parasitoids, predatory midge i.e. *Aphidoletes aphidimyza* and entomopathogenic fungus i.e. *Verticillium lecanii* vegetables which are grown in greenhouse, mainly in Europe. In field of biology, biological controlling agents could get affected in a different manner by cropping system. As an example, is was found bigeyed bug (i.e. Hemiptera: Lygaeidae) and lady beetles (i.e. Coleoptera: Coccinellidae) have been more effective as found in radish.

Cultural manipulations might be beneficial for the parasitoids and predators. In Washington, the bands which are placed around trunk of the peach trees actually provide and this results in reduction of number dispersed to the vegetables. As in California, brown lacewing (i.e. Neuroptera: Hemerobiidae) which has led to consistent

reduction in population of green peach aphid in the asparagus. In New Zealand, the level of pollen were supplemented by the inter-planting of flowering plants along with cabbage.



Fig 8: A bigeyed bug (Hemiptera: Lygaeidae), a predator of the green peach aphid, feeding on a whitefly. Credits: Jack Dykinga, USDA increasing predation of aphids by flower flies (Diptera: Syrphidae).

Cultural Practices

Behaviour of green peach aphids which is over-wintering, might be restricted towards Prunus or any other site which has certain restrictions fosters researches based on certain techniques for reduction in aphid abundance. In a similar manner, flower and vegetable plants are grown in greenhouse during the month of winters have has shown excellent infestation source during following spring (Bishop and Guthrie 1964) [4]. Wherein it has been infested with the aphids as a very important element of overall potato leaf-roll reduction effort. There could be use of row covers for using inhibit development of the aphid population. Smaller arthropods like green peach aphids are susceptible towards injuries through secretion of the glandular leaf hair which are found on a few plants, which includes wild potato (as described by Tingey and Laubengayer 1981) [30]. The younger aphids are said to be quite susceptible. It could be said to be a promising source which leads to plant resistance, the particular valuable trait is being incorporated into popular commercial cultivars.

Disease Transmission

There are some diseases which are based on virus and they get transmitted through the green peach aphids and the viruses which exist in the peaches would require sufficient time for transmission. Those seed potatoes which are infected act as the main source of leaf-roll in many such potato crops, so it is very important to plant disease-free seeds to minimize incidence of such diseases. The growers

would commonly inspect the fields to find if there are any signs for the said disease and in case any infection is found, then such plants should be immediately removed and destroyed so that they do not affect the other plants which are quite nearby and this process is called "roguing." Transmission of the non-persistent viruses like cucumber mosaic viruses could sometimes be decreased by coating of the foliage with the mineral oil or vegetable oil. Oil has been postulated for inhibiting acquisition and transmission of virus through preventing attachment of virus to aphid's mouthpart or for reduction in probing behaviour (Loebenstein and Racciah 1980) [13]. Oil seem to be the most effective when amount of diseases in the areas which is available for transmission to crops at lower level. When aphid densities or disease inoculum at the higher levels, oil might be inadequate protection (Umesh *et al.* 1995) [31]. There are also many plants might be damaged by the application of oil, which is especially during the hot weather. The green peach aphids have been quite responsive for alarming pheromone that is normally produced when the aphids which have been disturbed. The application of the alarm pheromone have indicated potential for disrupting transmission of viruses (Gibson *et al.* 1984), but it has yet not been considered as an operational technology. There is a sex pheromone which has also been known from the aphid, but this functions only at shorter distances and is not proved yet as being useful in the management of aphid.

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