IS LEMON PEEL IS RESPONSIBLE FOR CONTROLLING WHITE FLY? A REVIEW ARTICLE

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***Abstract*: Whiteflies are soft-bodied, winged insects closely related to aphids and mealybugs. Despite their name, whiteflies are not a type of fly, though they do have wings and are capable of flying. Whiteflies can be as small as 1/12 of an inch, are somewhat triangular in shape, and are often found in clusters on the undersides of leaves. They are active during the day and will scatter when disturbed, so they can be easier to spot than some nocturnal insect pest.There are hundreds of species of whiteflies, but most affect only a small number of host plants. However, there are a few whitefly species that affect a wider range of plants, which make them the most problematic in horticulture. These whitefly species include the greenhouse whitefly, banded winged whitefly, giant, and silverleaf whitefly, among others. Silverleaf whiteflies, which are slightly smaller and more yellow than other whiteflies, are especially common in the southern United States.**

I. INTRODUCTION

Whiteflies feed by tapping into the phloem of plants, introducing toxic saliva and decreasing the plants' overall turgor pressure. Since whiteflies congregate in large numbers, susceptible plants can be quickly overwhelmed. Further harm is done by mold growth encouraged by the honeydew whiteflies secrete. This may also seriously impede the ability of farms to process cotton harvests. Whiteflies share a modified form of hemimetabolous metamorphosis, in that the immature stages begin life as mobile individuals, but soon attach to host plants. The stage before the adult is called a pupa, though it shares little in common with the pupal stage of holometabolous insects. Whiteflies develop rapidly in warm weather, and populations can build up quickly in situations where natural enemies are ineffective and when weather and host plants favour outbreaks. Large colonies often develop on the undersides of leaves. The most common pest species•—such as greenhouse whitefly (Trialeurodes vaporariorum) and sweet potato whitefly (Bemisia tabaci)—have a wide host range that includes many weeds and crops. These species breed all year round in warmer parts of California, moving from one host to another as plants are harvested or dry up.

II. TRADITIONAL PRACTICES:

Testing the Efficiency of Limonene in the skin of lemon by using water to control whitefly.

III. HYPOTHESIS:

The Application of limonene (Limonene is a colourless liquid aliphatic hydrocarbon Classified as acyclic monoterpene, and is the major component in the oil of citrus fruit peels) formulation against the whitefly which destroys majority of sap from phloem, the food- conducting tissues in plant stems and leaves.

IV. OBJECTIVES:

Preparation of limonene-based formulation.Screening of Phytochemicals in Citrus lemon Peel Extract to evaluate its Anti-pesticidal property.

V. PREPARATION OF LIMONENE-BASED FORMULATION:

According to the farmer, they collect the skin of the lemon after juice is Extracted from it. Take1kg of these Lemon skins, and soak them in 10litres of water. Thereafter, the solution is filtered and sprayed on the crops to control whitefly. This Is because whitefly hate the smell of limonene. Limonene belongs to a group of compounds known as terpenes, whose strong aromas protect plants by deterring predators. Limonene is one of the most common terpenes found in nature and may offer several health benefits. It has been shown to possess anti- inflammatory, antioxidant, anti-stress, and possibly disease-preventing properties. Limonene is a popular additive in foods, cosmetics, cleaning products, and natural insect repellents. For example, it's used in foods like sodas, desserts, and candies to provide a lemony flavour.

Limonene is extracted through hydro distillation, a process in which fruit peels are soaked in water and heated until the volatile molecules are released via steam, condensed, and separated. Due to its strong aroma, limonene is utilized as a botanical insecticide. It's an active ingredient in multiple pesticide products, such as eco-friendly insect repellents. In a series of bioassays with mealybugs, aqueous solutions of 1% limonene were tested that used from 0.50 to 1.50% all-purpose spray adjuvant (APSA)-80 as an emulsifier/surfactant. The two ingredients were added to water or to 0.1% Silwet L-77, an agricultural surfactant. Using 1% limonene, 0.75% APSA-80 and 0.1% Silwet L-77, a semi-transparent mixture (primarily a microemulsion) was obtained that was safe for most plants and provided good control ofmealybugs when sprayed or used in 1-min dips. Used at half strength, this mixture controlled > or =99% of whiteflies, whereas the full-strength mixture controlled from 69 to 100% of mealybugs and scales, including > or =93%

control of root mealybugs. In side-by-side greenhouse tests, this mixture was superior to a 2% solution of insecticidal soap or a 2% solution of horticultural spray oil. Mortality of green scales on potted gardenia plants averaged 95, 89, and 88% on plants sprayed with limonene, insecticidal soap, or horticultural oil, respectively. In a related test, these same sprays killed 44.1, 22.7, or 12.5% of third and fourth instar clustering mealybugs, respectively. Limonene has promise as a safe, natural pesticide for insect pests on tolerant plants. Although 1% limonene solutions damaged certain species of ferns, gingers and delicate flowers, they caused no damage to ornamentals with thick, waxy leaves, such as palms, cycads, and orchids.

VI. SCREENING OF PHYTOCHEMICALS IN CITRUS LEMON PEEL EXTRACT TO EVALUATE ITS ANTI- PESTICIDAL PROPERTY:

Phytochemicals are found in plants and are non-nutritive in nature but have certain disease preventing properties. They offer protection against pathogens and are not required by human beings for perpetuating life. Phytochemicals work in many ways such as antioxidants which protect the cells from damage. These can stimulate certain enzymes and can reduce the risk of various ailments. These can also act as antipesticidal and hormonal stimulant. Citrus (lemon) is one of the most commercial fruit crops grown all over the world. It is one of the largest plant species and is further consisting of 40 species which are found around the world. The major consumption of the fruit is through juices as it is beneficial for prevention of diseases. The fruit juices contain Vitamin C (ascorbic acid). These fruits contain phenolics, flavonoids, vitamins, and essential oils.

VII. MATERIALS AND METHODS:

Collection of Sample: Fresh lemon fruits were brought from the market. The fruits were washed and then disinfected. The juice was removed from the fruit thoroughly and the peel was carefully removed. Then the lemon peels were soaked in the 10 litres of water for 1 month. Then these were taken for extraction process.

VIII. PREPARATION OF EXTRACT:

After one month, the extract was isolated through the filtration process and then sprayed to the infected plants.Plants have some specific chemicals called phytochemicals in them which may not have nutritional property as such, but they can work towards the deterance of diseases. As they can be absorbed by the human body, they can minimize the free radical damage caused to the cells, as a result of oxidative stress. Lemon is a citrus fruit considered to be rich in phytochemicals. This study provides an explicit perception about the Citrus limonum portion (pulp or peel), as to which one has more number of phytochemicals. The aqueous extracts of the pulp revealed the presence of carbohydrates, alkaloids, tannins, fixed oils, reducing sugars, proteins, cardiac glycosides, steroids, phytosterols, phenols and flavonoids, whereas the ethanolic pulp extracts showed only the presence of fixed oils, reducing sugars, cardiac glycosides, steroids, phytosterols, flavonoids and amino acids. On the other hand, the aqueous peel extracts showed the presence of carbohydrates, alkaloids, tannins, fixed oils, proteins, cardiac glycosides, steroids, phenols and flavonoids and amino acids, whereas the ethanolic peel extracts revealed that they contained carbohydrates, saponins, tannins, fixed oils, cardiac glycosides, steroids, phytosterols, phenols and flavonoids. Lemon oil has a fresh and elegant lemon aroma, as well as clear pinene and terpene aromas. Its distinctive aroma is derived from aliphatic aldehydes, terpene alcohols, terpene alcohol-acetic esters, and terpenes (limonene, pinene, and terpinen.

IX. PREVENTION:

Management of heavy whitefly infestations is difficult. The best strategy is to prevent problems from developing in your garden or landscape. In many situations, natural enemies will provide adequate control of whiteflies; outbreaks often occur when natural enemies are disrupted by insecticide applications, dusty conditions, or interference by ants. Avoid or remove plants that repeatedly host high populations of whiteflies.

In gardens, whitefly populations in the early stages of population development can be held down by a vigilant program of removing infested leaves or hosing down with water sprays. Reflective mulches can repel whiteflies from vegetable gardens, and yellow sticky traps can be used to monitor or, at high levels, reduce whitefly numbers. If you choose to use insecticides, insecticidal soaps or oils such as neem oil may reduce but not eliminate populations. Systemic insecticides may be more effective but can have negative impacts on beneficial insects and pollinators. Hand removal of leaves or plants heavily infested with the nonmobile nymphal and pupal stages may reduce populations to levels that natural enemies can contain. Remove and destroy whitefly-infested vegetable plants after harvest. Always inspect new plants for whiteflies and nymphs before introducing them in the greenhouse or garden. If you have evergreen perennial plants that consistently host high populations of whiteflies in the winter season, then you may wish to remove these plants to lower overwintering populations. If you have high populations of whiteflies in a greenhouse, removing all host plants from the greenhouse for at least 2 weeks (and assuring that no whiteflies can enter from outside) may eliminate problems. Water sprays (syringing) may also be useful in dislodging adults. Watering can also reduce the hot, dry dusty conditions that favours whiteflies and inhibit their natural enemies.

X. BIOCONTROL AGENTS:

Whiteflies have many natural enemies, and outbreaks frequently occur when these natural enemies have been disturbed or destroyed by pesticides, dust build-up, or other factors.

General predators include lacewings, big-eyed bugs, and minute pirate bugs. Several small lady beetles including Clitostethus arcuatus (on ash whitefly) and scale predators, such as Scymnus or Chilocorus species, and the Asian multi-coloured lady beetle, Harmonia axyridis, feed on whiteflies. Whiteflies have a number of naturally occurring parasites that can be very important in controlling some species. Encarsia spp. parasites are commercially available for release in greenhouse situations; however, they are

not generally recommended for outdoor use because they are not well adapted for survival in temperate zones. Avoiding the use of insecticides that kill natural enemies is a very important aspect of whitefly management.
Products containing carbaryl, pyrethroids, or imidaclo•prid (especially as a foliar application) can be particularly disruptive. Control of dust and ants, which protect whiteflies from their natural enemies, can also be important, especially in citrus or other trees. Whiteflies can be difficult to control with insecticides. Most less-toxic products such as insecticidal soaps, neem oil, or petroleum-based oils control only those whiteflies that are directly sprayed.
Therefore, plants must be thoroughly covered with the spray solution, and repeat applications may be necessary. Be sure to cover undersides of all infested leaves; usually these are the lowest leaves and the most difficult to reach. Use soaps or oils when plants are not drought- stressed and when temperatures are under 90°F to prevent possible "burn" damage to plants. Early evening, when there is enough light to safely apply products but when the sun is not shining directly on plants, may be a good time to spray.The soil-applied systemic insecticide imidacloprid can control whitefly nymphs. Imidacloprid can have negative impacts on natural enemies, honey bees and other pollinators in the garden,especially when applied as a foliar spray or as a soil application to plants that are flowering or soon to be flowering. It can also cause outbreaks of spider mites. Reserve its use for special situations where these problems can be avoided. Avoid using other pesticides (other than soaps and oils) to control whiteflies; not only do most of them kill natural enemies, whiteflies quickly build up resistance to them, and most are not very effective in garden situations.

XI. FURTHER APPROACH:

1. Impact of Climatic change on whitefly.
2. Host range of whitefly.
3. Biopesticides against whitefly.

XII.ACKNOWLEDGEMENT:

The authors express their sincere thanks to the host Institution Dr.N.G.P. Arts Science college, Management, Principal, Deans, Head of the Department, Guide and all other staffs of Department of Biochemistry for rendering all the facilities and support.

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