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EFFECTS OF *HIBISCUS ROSA SINENSIS* AND *CYMBOPOGON CITRATUS* AGAINST APHIDS : A REVIEW

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ABSTRACT

Aphids are the major pest on crops. Use of chemical pesticides create problems. Chemical pesticides affect the human health, environment and also affects non target organisms. Natural insecticide produced from plants are more promising. The *Cymbopogon citratus* and *Hibiscus rosa sinensis* are very important plant which have great effect on insects. The aim of this review to tell about essential oil and extracts which affects insect growth and how much it is effective. The problem of agriculture crop was pests and these pests are responsible for damaging crops and effect nutritive value. Lemon grass oil repels insects like mosquitoes, aphids due to which it contains citral and also myrcene, citronella, citronellol, and geraniol. The essential oil is derived from aromatic plants has observed as risk free alternatives.

Keywords : Aphids, lemongrass, Hibiscus rosa and essential oil.

Introduction

Aphids are major agricultural pests that cause important production losses of crop plants by causing the damage both through the direct effects of feeding and by vectoring harmful plant viruses. Aphids have distinctive traits for identifying and exploiting their host plants including the expression of polyphenisms a form of discrete phenotypic plasticity characteristic of insects taken to extreme in aphids (Yu XD *et al.*, 2016). Aphids are damaging pests on the plants. Aphids use their stylets to enter the plant tissue to feed on phloem sap. In addition, some aphids vector important viral diseases of plants (Nalam, 2019). The damage of aphids is among the most serious of agricultural and horticultural problems. A pest aphid species may affect either very specific types of crops or a group of related crops hosts example Crucifera or may be quite polyphagous within and between plant families. Aphids cause damage and lower agricultural yields in several ways they can grow to high population densities, removing plant nutrients and may also damage plants by removing enough sap and hence lead to withering and then death. Salivary secretion of some aphids are phytotoxic, causing stunting, leaf deformation, gall formation and therefore damaging the plants. The most serious posed by aphids is the vectoring of plant viruses. Virus infected plants often show an aphid yellowing and have increased free amino acids. Aphids also affects the changing the host metabolism to their advantage and hence take over the plants physiological functions (Sorensen, 2009). Morphogenetic different soldiers produced by social aphids to save their colonies. These aphids produce first instar sterile soldiers with differentiated parts of body and behaviour of defence such as hind leg moving. These aphids feed on bamboo and cause infection of all body parts of

bamboo like stem, shoot (Siddiqui *et al.*, 2019). Aphids are tiny sap sucking insects and it belongs to super family aphidoidea. In Egypt legume crops is infested by sucking insect called Cowpea aphid (*Aphis craccivora*, Koch) Homoptera: Aphididae. They feed on sap sucking plant and deform plant structure like curling leaves, inhibiting shoot growth and decreasing last production and plant strength (Abbas *et al.*, 2016). Many aphids transmit plant diseases like soybean mosaic virus (SMV). Good example of aphids is *A. Craccivora* which are causing problems of legumes (Abbas *et al.*, 2016). Throughout the world cabbage aphid are present, *Brevicoryne brassicae* L. is found in brassica crop and cause serious destruction and outbreaks. First time in Europe this aphid was recognized and after that reported other countries of world with temperate climate. The yield loses in many cruciferous crops due to aphids feeding on young leaves. Aphids pick up virus by diseased plant and bring to healthy plants by feeding and cabbage aphids are responsible for it. Black bean aphids are found on beans, peas, beets, potato, tabaco and many other host plants. These aphid transfer forty plant viruses. The plants become stunting, curling leaves, deform the structure of plant (Chalise *et al.*, 2019). However, many pesticides have been approved for control of aphids. New sources are being rapidly examined (Chalise *et al.*, 2019).

Cymbopogon citratus belongs to the family poaceae and order is poales. *Cymbopogon citratus*, is famous for agricultural plant, it is found in India and Srilanka. Parts of *Cymbopogon citratus* are used for some herbaceous preparation as well as medical remedies, while essential oil produced from its leaves are used for perfume and cosmetics. The insecticidal activity of *C. citratus* essential oil has pesticidal activity against some agricultural and non-

agricultural pests. Among transmitters, its pursuit against adult and larvae stage of various insects (Kumar *et al.*, 2012). Lemongrass and west Indian grass are other names of *Cymbopogon citratus*. The 65-85% citral in addition to myrcene, citronellal, citronellol, and geraniol are composition of lemongrass (Skaria *et al.*, 2007). By separation of oil from the water is due to condensation, distillation. Lemongrass oil is used for attraction of swarms sometimes. The lemongrass oil has ability to repel deadly stable fly (Baldacchino *et al.*, 2013). Combination of lemongrass oil and virgin coconut oil are used for aromatherapy. The pharmacological activities of *Cymbopogon citratus* are antifungal, antibacterial and anti-inflammatory. Many other effects have also been studied like antioxidant, antimalarial, hypoglycemic (Shah *et al.*, 2011). The importance of lemongrass oil is used to formation of aflatoxin and control fungal growth of *A. flavus* in stored rice (Zhang *et al.*, 2016). *Cymbopogon citratus* oil is used as repellent and pesticide against insects. The essential oil of *C. citratus* and citral and their performances change from one variant to other even all are toxic to flies (Pinto *et al.*, 2015).

Hibiscus rosa Sinensis is also famous for other names such as chinese hibiscus, china rosa, Rose mallow and shoeblack plant. It is found in tropical and sub-tropical regions but this is not wild. The order is Malvales. phytochemical analysis showed that Hibiscus Rosa contained anthraquinones quinin's phenols essential oils and steroids. The flowers and other parts of plant are used to make medicine. People use hibiscus for high blood pressure, high cholesterol, and other conditions. It has true leaves, stems and roots. Hibiscus plant are fully rich in phytonutrients like pectin, malic acid, citric acid, flavonoids etc (Missoum, 2018). Carl Linnaeus was given the name of *Hibiscus rosa sinensis* in 1953 species plantarum (Linnaeus, carl 1753). *Hibiscus rosa sinensis* are edible and are used in salads in the pacific islands. it is used for hair care making and used a ph indicator. *Hibiscus rosa sinensis* ash oil is very acceptable in repelling mosquitoes. Hibiscus rosa extract causes death of Aedes larvae and the leaf extract of hibiscus has larvicidal potential. The flowers and other parts of plant are used to make medicine. People use hibiscus for high blood pressure, high cholesterol, and other conditions. Hibiscus plant needs about 6 hours of full sun light per day in order to bloom to its fullest potential. It will still grow perfectly well in partial shades but in more sun light hibiscus get better it will bloom up. Best repellent for mosquitoes. Severe infestations can cause serious damage to hibiscus and eventually kill the plant. Aphids are tiny pest that are often brightly coloured in red or pink or may be dull black or brown. These insects also feed on below of the leaves of plants usually on tender new growth. Spider mites also damage the hibiscus. It produces the worst effect on stressed plants. Keeping your hibiscus plant watered will help it unaffected mite induced damage. Because mites prefer dry conditions use an overhead spray when watering your hibiscus wetting the leaves to increase humidity. Apply rosemary oil or insecticidal soap to hibiscus pester with many winged aphids or to any plant whose aphid population is not decreased by water. During summer and rainy season potency is lower than in winter season. It possesses fertility activity has been studied (Agarwal *et al.*, 2013). It is fully rich in tannins, flavonoids, steroids, alkaloids, saponins, total phenols, total flavonoids, total proanthocyanidin. it belongs to family Malvaceae mallow (Khristi, *et al.*, 2016).

Review of Literature

The major pest of beans is *Aphis craccivora* in region of aphid's whiteflies and thrips. Flavonoids has important properties to attractant pollinators but it is also having repellent property against herbivores. Fertility of aphids affected. (Naama *et al.*, 2013). Aphids cause diseases like SMV. Aphids cause diseases through infected seed. Distortion, curling, stunting occurred in plants (Hajimorad *et al.*, 2017). In this references Botanical oils had great toxic effect against treated aphids. Test in which plants extract were used against the two spotted spider mite *T. urticae* but good acaricidal action of plant extract against *T. urticae* were chillipepper and lemongrass of their lc50 and lc90 value. In haemolymph *Spodoptera litura* larvae extract of plant decreased the protein and carbohydrates. Lupine was more effective than lemongrass (Abbas *et al.*, 2016).

In this study depicts that essential oil of garlic, soyabean oil and Eucalyptus oil change aphid structure. These essential oils reduce the population of these aphids. *R. officinalis*, *E. golobulus labill*, *A. sativum* used against aphid to checked their effectiveness and repellency (Castresan *et al.*, 2013).

Cymbopogon citratus is used in traditional noxious pesticidal against various pests. Tested the exertion of *Cymbopogon citratus* oil and its main effective component citral is used against various insecticides and in *C megacephala*. Continuance of post embryonic development, weight of larvae, sex, ratio, death index and percentage of external features distortion (Pinto *et al.*, 2015).

The essential oil takes out from *C. schoenanthus* comprise of a high percentage of monoterpenes. Its vital part was piperitone. The *Cymbopogon schoenanthus* L. Spreng oil (Poaceae) was the most venomous to adult and to eggs and neonate larvae. the fourth instar larvae and pupae growing inside the seed, were bear more. However, these benign instars were the stages most willingly governed by natural enemies. 100 seeds and fifty pairs of *C. maculatus* adults were tested. Counted dead of adults because used of crude essential oil by fumigation test (Ketoh *et al.*, 2004).

Hibiscus mealybug has adverse effect on all types of crops. Hibiscus mealybug is nonnative pest discovered in US in floxide. This pest is direct effect on phloem of crops. this plant confluent on phloem with their scanty and slim mouth and absorb the fluid from plants which causes in deformation of plants. Mealybug has broad diversity of changes in structure, biotic adaptation, movability by making it dangerous pest in all agricultural crops (Fatima *et al.*, 2016).

The *C. citratus* oil extract have larvicidal and insecticidal effect and it is more effective and death rate was 100%. *C. citratus* is good and have property to repel the insects (Musa *et al.*, 2015).

The *C. odorata* oil have the best oviposition deterrent with effectual repellency against egg laying house fly females. Essential oil of Thai herb has great effect on egg laying and larvicidal housefly control. Essential oil from herbs is ecofriendly and good human health alternative for insect control (M. Soonwera, 2015).

The *Ocimum basilicum*, *Ocimum canum*, and *Cymbopogon citratus* cultivated in Cameroon and their essential oil used against *plasmodium falciparum* and has properties to reduce the growth of *plasmodium falciparum*

and death occur in *An. Funestus s.s.* larvae. It has also anti plasmodial property (Ntonga *et al.*, 2014).

This study depicts traditional pesticides create worst effect on water bodies and also humans and environment. Natural pesticides produced from plants are good for environment and humans. Plants is used to kill and repel insects in ancient time and present time also. Phytochemicals perform as repellent and control insect growth. *Cymbopogon citratus* and *Croton macrostachyus* are famous medicinal uses. Repellent features against mosquitoes (Karunamoorthi *et al.*, 2010).

Essential oil *Eucalyptus citrodora* determined to have average pesticidal activity against green peach aphids (nymphs) and *F schultzei* nymphs. The essential oil having some components were as citronellol, geraniol, beta citronellol and sigma cadinene. Aphis nerii was good resistant to pesticidal soaps found on extraction of sunflower and olive than *Macrosiphum rosae* (Atanasova *et al.*, 2018).

Essential oil enters into the aphid's cuticle which have good potential to it and absorbed from alimentary canal of aphids. it functions as neurotoxins against insects (green peach aphids) and destroys the sensation. Twenty-five essential oil are used against mosquitoes and used lemon grass Lc50 value 43.79ppm and orange oil Lc50 value 54.97ppm (Tawfiq *et al.*, 2017).

Insecticide obtained from mint is good and more successfully used in management of *Myzus persicae* and give ecofriendly environment and standard crops. Mint essential oil has great result with ethanol and chloroform with Lc50 used early nymphal instars. Anise oil is a good biopesticide and give safe environment in management of pest used *Myzus persicae*. Extract of *Anise illicium verum* fruit and various solvents were poisonous to adults of *Myzus persicae*. Suds toxicity of cumin and anise essential oil has been described used cotton aphid. Essential oil of anise and its compound E anethole are poisonous Ld90 to bird cherry oat aphids (Hemiptera; Aphididae). By used bioassay test mixture of anethole and fenchone at 800ppm has great toxicity give 100% mortality used against some aphids. Great fumigant toxicity on adult red flour beetles when used mixture of *E. anthole* and 1-8 cineole ratio 1:1. Heat increases the toxicity of *Tribolium castaneum* was also detected. Good pesticidal effect on trichoplusia ni huber of lemongrass or thyme essential oils or double combination of two compounds have good activity in the green house (Villalobos *et al.*, 2020).

House fly (*Musca domestica L.*) is one of the most common and important insect pests of household and domestic, there has been developed resistance to chemical insecticides. The green pesticides obtained from plant essential oils are an excellent alternative to synthetic pesticides. From these plants *Cananga odorata Lamk*, *Cymbopogon Nardus* and *Syzygium aromaticum* essential oil is produced and evaluated for their larvicidal and oviparous deterrent activity against house fly. The essential oils from *S. aromaticum*, *C. odorata* and *C. Nardus* exhibited high ability for development of green pesticides for house fly control (Soonwera, 2015).

The efficiency of lemongrass extract was tested on Anopheles mosquito and its larvae. The oil was extracted using petroleum ether and Soxhlet apparatus. Lemongrass

can serve as an insect repellent in order to minimize disease transmission by vector such as mosquitoes. Lemongrass is a safe and natural insect repellent that is just as effective as the commercial chemical product (Musa *et al.*, 2015).

In recent study the *M. piperata L.* and *M. pulegium L.* and their essential oils checked their toxicity and *lecanicillum muscarium* infective were analysed in melon aphid. Compounds present in piperata such as menthol, menthone, and carvol. In pulegium compounds are present such as piperitenone, decane and limonene. These essential oils having great effect on aphis gossypii. Essential oil combined with *L. muscarium* death of aphid gets higher and called additive not synergistic. Essential oils have good ability in management of aphis gossypii (Ebadollahi *et al.*, 2017).

Natural oils like basil, citronella oil, eucalyptus globulus juniper oil and pogostemon patchouli used for control fox glove aphid found in eggplant. In this reference investigated Essential oil extracted from different parts of *Cinnamomum camphora* and showed repellent and pesticidal effect on cotton aphids. Linalool was important giver for pesticidal and repellent activities. *C. camphora* may be have good ability to form natural insecticide and repellent property for control cotton aphids. Three essential oil obtained from leaves, twigs and seeds have great insecticidal property against cotton aphids (Atanasova, *et al.*, 2018).

The ticks and tick born disease is important to control for public health throughout the world. Acaricides chemical pesticide that is used for ticks but it has some problems towards environment, mammals and tick's immunity. Use of plant essential oil against ticks is promising and effective. Essential oil of *Cymbopogon citratus* (lemongrass) have acaricidal properties and presence of monoterpenes such as citronellol, geraniol and limonene. *Cymbopogon* has good insecticide and have repellent action against mosquitoes. The recent study evaluated the effect of *C. citratus* essential oil on the mortality and structure of *H. longicidal*. Essential oil effect for future application in the control of pests. In this reference midgut gets smaller in the larvae, nymphs and adult ticks. This was supported by the showing of *Apis mellifera jemenatica* to δ methrin and abamectin resulted in adjoining and break epithelium layer of midgut and showed the complete vanish of border and merged cells. Also destroy midgut of honeybees due to thiamethoxan with a day (Agwunobi *et al.*, 2020).

Citral and geranial have been demonstrated for their antifeedant activity against three species of mosquitoes, *C. pipiens pallens*, *C. pipiens quinquefasciatus*, and *Aedes albopictus*. The study investigates efficacy of *C. citratus* oil for the control of larval and pupal stages of houseflies. in this study demonstrate the insecticidal activity of *C. citratus* and monoterpenes as good housefly control agent. Monoterpenes can be absorbing in such products to avoid the similarity of problem and increase the efficacy and reliability thereby advancing marketability and commercialization of the resultant product (Kumar *et al.*, 2012)

Essential oil extracted from *C. schoenanthus* contains 61% of piperitone. The crude oil is toxic to different developmental stages of *callosobruchus maculatus*. In the present result of a comparison between insecticidal activity of piperitone and the crude essential oil different developmental stages of *C. maculatus* is presented. Piperitone was reported as a powerful repellent and anti-

appetent agent against ant of *crematogaster* spp. against *C. maculatus*, piperitone was very toxic to adults newly laid eggs and neonate larvae (Ketoh *et al.*, 2006).

Sucking preventing properties were present in thyme, lavender, spearmint and pepper mint and remove aphids. Essential oils prevent from settling and pathetic their taste and smelling senses. The sealing films thyme oil vapor inhabitant and create death of aphids but also cause repellency of aphids. Thyme oil powerfully hindered the aphids from settling its sucking inhibition. It has fumigant and repellency properties. Sucking preventing activities were present in basil, pennyroyal, mint and marjoram. They have no repellency properties against the aphids. Repellent activity present in rosemary against aphids. The L. (-) carvone and thymol present in spearmint and tyme oils. These two components create antifeedant and prevents settling action in spearmint and thyme oils. the labiate plant which play important role to carry over the aphids on these plants and damaged aphids taste and smelling senses (Hori, 1998).

Green peach aphids (wingless) is feeding on many different kinds of foods. *Myzus Persicae* cause infection about hundred plants species and transformed viruses around the globe. Extraction of Dokudami, tansy and sweet pepper remove the aphids but use chives instead of Dokudami kills the aphids. The better working repellent was Dokudami against aphids. The extraction of Dokudami was used for controlling green peach aphids. Pepper mint have great effect on reproductive inhibition of aphids and extraction of peppermint higher the aphids population at sixteen days and gets down thereafter. Mint extraction have property to masked the odour of plant (Ikeura, 2012).

Higher beneficial effect was noticed when peppermint extraction cause death of black bean aphid larvae with concentration higher rather than wingless females. Fresh plants are more working than dried plants. The menthol, menthofuran, menthone, menthol esters, menthol acetate, valerate, phellandrene, pinene, cineole, menthofuran, pipertone, jasmone, tannins, flavoids, mineral salts, mustard and phenolic acid components were present in peppermint. In this study showed peppermint effect against aphids but also used for mosquitoes. Verum has good ability as a pesticide and safe for environment (Binias *et al.*, 2017).

Aphidicidal activity against *Brevicoryne brassicae* found in *Laurus nobilis*. It also shows toxicity against *tribolium confusum* and good repellent against *tribolium caestum*. Insecticidal activity against *Myzus Persicae* found in *Ocimum basilicum* (Niroumand *et al.*, 2014).

This study depicts that neem preparation produce antifecundity and antifertility effect in *Myzus Persicae* and *A. Pisum*. Neem seed oil decrease the aphid species (Koul, 1999).

This study demonstrates that good effect of essential oils on reproductive system of cabbage aphids. The *J. excelsae*, *J. oxycedruss*, *F. vulgare*, *P. anisum*, *R. officinales*, *J. regia* and *L. nobilis* essential oil used against cabbage aphids. These essential oils have best Aphidicidal activity on the cabbage aphids (Isik *et al.*, 2009).

This study depicts that citronella and Alfazema have good killing effect on aphids. Alfazema has other benefit that it is attractive towards ladybugs. It also showed that effect of essential oil on behaviour of aphids. Alfazema is more

effective and lethal to funnel flowers (Abramson CI *et al.*, 2006).

Plants like *A. conyzoides* (L.) *P. hysterothorus* (L.), *L. camera* (L.), *S. migrum* (L.), *Cannabis sativa* (L.), *Calotropis gigantean* (L.), *L. chinensis*, *C. angustifolia* their extraction is used against *M. Persicae* and *B. brassica* and checked their insecticidal and repellent property against *M. Persicae*. The *L. camera* extraction showed toxic and antifeedant effect and cause death of aphids. These plant extractions are risk free alternative than synthetic insecticide (Yadav *et al.*, 2017).

The extraction of *L. augustifolia*, *R. officinalis*, *N. cataria*, *O. majorona* used against cabbage aphids. The *L. augustifolia* and *N. cataria* shown good poisonous effect. The *R. officinalis* and *O. majorona* have low toxic effect. These two plant *N. cataria* and *R. officinalis* create problem in cabbage (Pavela R, 2006).

The essential oil of *Thuja plicata* is more toxic to cowpea weevil, *C. maculate*. It has also fumigant property against *S. oryzae*. Positive control found in *A. grandis*, The *P. menziessii*, *R. officinalis*. The *T. plicata* has great toxicity against *P. fagi*. These essential oils were more effective and working on aphids (Aurash *et al.*, 2015).

In this study clove oil have ability to kill the aphids. The most risk-free extract is clove oil. The clove oil influences the action of *C. maculata* and predacious capability of *C. maculata* (Toledo *et al.*, 2020).

Conclusion

Aphids are found in agricultural crops and decrease production of yield. *Cymbopogon citratus* oil is most effective against insects. The efficacy of plant extract oil was very effective and Mortality rate gets high. Likewise, other essential oil was also effective against insects. So, these plants have good effect on aphids, mosquitoes and other insects. Plants are fully rich in natural substances and have good ability to prepare organic pesticides that can be used in the development of surrounding safe alternative methods for insect control rather than synthetic pesticides. Natural pesticides obtained from plants are more promising, easily available and easily biodegradable. Extraction of plants and essential oils have good capability to controlling pests. These natural pesticides may be providing alternative method in future.

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