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MANAGEMENT OF *MACROSIPHUM ROSAE* L. ON DIFFERENT CULTIVARS OF *ROSA INDICA* L. BY USING DIFFERENT BOTANICAL EXTRACTS AND DETERGENT SOLUTION

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ABSTRACT

The research was conducted in the rose field area of Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi during 2008 to 2009. Botanical extracts of tobacco, neem and detergent solution was used as treatment for the management of rose aphids. Data were recorded on weekly bases. Nymphs, winged and wingless adults were counted from leaves (upper, middle and lower sides), buds and flowers by visual observation from tagged plants. Aphid's population start to develop in the month of November and population decline with decline in temperature in the month of December, While it started rising again at the end of February. Significantly greater aphid populations observed on Perfecta than other varieties however, there were significantly lesser aphids observed on Christen Diar. Botanical products tobacco and neem extract have been found promising and useful for control. Among botanical extracts, the highest percentages of aphids were killed consistently across the time after application by tobacco leaf extracts. Neem was also found to produce appreciable result. Reductions of aphid papulation increased with increase of the time after treatments were applied. These studies reveal that farmers growing roses on commercial scales should grow Christen Diar to avoid aphid attack. Research scientists can incorporate Perfecta and Christen Diar in their rose germ plasms being tested against the attack of aphids. The farmers can also use tobacco and neem extracts at the time of initial infestation of aphid on rose plants

Keywords: Aphid, Cultivars, Extract, Incorporate, Management, Neem, Perfecta, Tobacco

INTRODUCTION

Rose (*Rosa indica* Linnaeus*)* is older than man and has been grown on earth for millions of year. Rose is universally acclaimed as the "Queen of flower" (Datta, 1997). Rose has been most important crop in the floriculture industry. The genus *Rosa* includes 200 species and 18,000 cultivars (Weiss, 1997; Gudin, 2000). At an annual value of $10 billion, roses are used as cut flowers, potted plants, and garden plants. Their economic importance also lies in the use of their petals as a source of natural fragrances and flavorings. The damask rose (*Rosa damascena*) is the most important species used to produce rose water, attar of rose, and essential oils in the perfumery industry. (Zuker *et al*., 1998). Rose flowers have medicinal value especially Gul-e-kand and Aurq-e-gulab. Gul-e-kand is used mainly for stomach disorders. Aurq-e-gulab is used as eye drop for different eye infections (Vernon, 1982).

Roses are attacked by a number of insects pests like rose aphids (*Macrosiphum rosae*), large rose sawfly etc. There are approximately 4,000 aphid species in the world. Life cycles and preferred hosts vary with each type of aphid. Thirty-one species of aphids are narrated from Rosa species. Rose aphid (*M. rosae* L.) and *M. rosaeiformis* 'das' potato aphid *M. euphorbiae* (Thomas); Cotton aphid *Aphis gosstpii* are very serious pest of rose plants. Severe infestations of aphid will cause leaves to curl upward and able to completely kill a small new plant. As they feed, they excrete sticky honeydew like substance that is attractive to ants. This honeydew substance can after a period of time grow molds or fungus, make the surface appear black and discolored (Jayma and Ronald, 1992).

Management is done with the development of thorough insect

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and disease scouting, record keeping, development of sound cultural and sanitation practices. In order to protect flowers from damage of aphids infestation, growers often apply synthetic chemical insecticides. Although synthetic insecticides usually provide quick and adequate control for the time being, they are usually expensive and leave long lasting residues over the exposed surface. In addition, due to other problems such as health hazards, undesirable side effects, development of pest genotypes resistant to pesticides, resurgence and upset of pests and environmental pollution caused by the continuous use of synthetic chemical pesticides, there is renewed interest in the application of botanical pesticides for crop protection. There have been a large number of plant products, which possess pesticidal properties and have been used successfully for controlling various pests in field and laboratory conditions. Botanical products like tobacco extract and neem oil have been found promising and useful for the pest control. A hard jet of water from the hose used to dislodge the aphids. Periodic syringing keeps the populations from doing much damage and allows the parasites and predators to build up to effective levels (David, 2001). Neem is well established commercial pesticide based on plant essential oils has recently entered the market place. (Murray, 2006). The neem tree has been used for more than 4,500 years in the Indian sub- continent. Neem is a native tree of India Pak. found in semi-arid conditions. The Neem tree is an incredible plant that has been declared the "Tree of the 21st century" by the United Nations. It is also called Holy Tree (*Azadirachta indica*) in India. The azadirachtin compound in neem has been recognized as an effective insecticide that is biologically selective, not harming the useful pest-predators. Neem used in agriculture as an Insecticide, Pesticide, Pest Fumigant, Fertilizer, Manure, Compost., Urea Coating Agent, Soil Conditioner and Bio Control Agents. Neem tree has super pharmaceutical and pesticide controlling qualities. Neem enters the system and blocks the real hormones from working properly. Insects stop to eat, to mate, or laying eggs. If eggs are produced they don't hatch, or the larvae don't molt.

The hypothesis of the research is to find out resistant and susceptible cultivar against aphids. For management purpose it is hypothesized that botanicals showed better results against aphids. Keeping in view the importance of screening in different cultivars of rose aphids and their management, the objectives of this study were to study the Rose aphid (*Macrosiphum rosae)* management by using different botanical extracts.

MATERIALS AND METHODS

The experiment were carried out at rose research farm of Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi in 2008-09 on screening of different cultivars of rose against rose aphids and its management. Management of rose aphids was done with the help of botanicals extracts of tobacco and neem. Rose varieties were selected in different replications under Randomized Complete Design.

Studies were carried out on rose varieties planted in the garden in March, 2006. Four varieties of rose including Ice Burg, Perfecta, Christan Diar and Wisky Mac were selected**.** Then the selected plots were marked for further data recording.

There were four blocks planted with different varieties of rose. Each block had a measurement of 576 sq ft (24ft×24ft). Distance between each square was 5 ft, while plant to plant distance was 4 ft. But the 1st plant distance was 2 ft from their respective sides. In each block there were four sub blocks as 144 ft (12 ft×12 ft).

Each plant was divided into three parts as leaves (upper, middle and lower), buds and flowers. Each variety was planted in a block design in three replications. Two plants of each variety were selected from each replication. The plants of Perfecta variety were allowed naturally infesting and colonizing by aphids. There are four treatments (tobacco solution, neem solution, surf water and tape water as control) with three replications. Before application of treatments, twelve plants were selected randomly. The population of live aphids on selected plants in each replication was counted and the plants assigned under each treatment were sprayed with corresponding extract using hand sprayer @ of 50 ml per plant. Plants under the control treatment received spray of tap-water only. Treatments solutions were applied on whole tagged plants and aphid numbers on the plants were recorded after 12 and 24 hours of the application of treatments. The percentage mortality of aphids recorded on selected plants was calculated.

Preparation of spray solutions

Botanical extract of tobacco was prepared at the rate of one per cent by soaking 10 g cured tobacco leaves in one litre of water for overnight. One gram detergent was added as surfactant in the prepared extract. This extract was then sprayed with hand sprayer at the rate of 50 ml per plant for the management of rose aphid. Similarly, ten percent neem extract was prepared by soaking 100 g fresh neem leaves in a litre of water by soaking overnight. One gram detergent was added as surfactant in the prepared extract and applied as spray at the rate of 50 ml per plant for the rose aphid control. Detergent solution was made by adding 20 gm surf in one liter water. The solution was applied @ 50 ml per plant. Spraying was used to keep the populations from doing much damage. A hard jet of detergent water was used from the hose to dislodge the aphids.

Data analysis

The data subjected to analyze by using statistical package MSTAT. ANOVA models were used for logical conclusions on the bases of results. For graphical representation of the results MS Excel Program was used.

RESULTS AND DISCUSSION

Management of aphids

A large number of plant products, which possess pesticide properties and have been used successfully for controlling

various pests in field and laboratory conditions. Botanical products tobacco and neem extract have been found promising and useful for the pest control. Results in the present study conducted indicated that different botanical extracts had notable effects on the reduction of aphid numbers. Murray (2000) studied that aphid nymphs (2^{nd} instar) show both behavioral effects and toxicity in a laboratory bioassay where aphids are placed on leaf discs dipped in emulsions of an essential oil based insecticide. Results were even more striking at the 48 h time of observation: at the lowest concentration tested (0.18%), the number of aphids feeding on discs declined from 50% at 24 h to 25%, and the number of dead aphids at this concentration increased from 22 to 60%.

Aphid management with tobacco extract

The number of rose aphids observed on rose plant leaves, buds and flowers by visual sampling treated by tobacco extracts shown in fig. 1,2,3. The means compared by Least Significant Difference (LSD) test at 1 % level (Table 1) indicated that aphid population significantly decreased with the increase in time. Alates, apeterous adults and nymphs were counted collectively on rose plant. Aphids found on selected rose plant were counted. There were 124, 87 and 141 aphids found on selected rose plant leaves, buds and flowers respectively. After 12 and 24 hours of treatment of rose plants with tobacco extract data were collected which show significant reduction in aphid population. The population of rose aphids started decline after 12 hours. The mean mortality of aphids was 56.25,37,70 after 12 hours and 68.75, 75, 86.67 after 24 hours of treatment on rose plant leaves, buds and flowers respectively. Statistical analysis for rose aphids mortality observed on rose plant leaves, buds and flowers showed that there were significant effects observed within treatments [$F_{(3,12)}$ =4.3401,7.3311 and 4.3311 respectively at P<0.0002 *]. Our finding are similar to Lane **(**2000) who reported that tobacco or natural pyrethrums proved good biological control against aphids. Among the different botanical extracts, the highest percentage of aphids were killed consistently across the time after application by tobacco leaf extracts, which was statistically significantly different from the percentages of aphids killed by the treatments. It was evident that aphid mortality consistently increased with the progress of time after treatments applied. Pyrethrum, tobacco and neem are well established commercially, pesticides based on plant essential oils have recently entered the marketplace and the use of rotenone appears to be waning (Murray, 2006). The insecticidal property of tobacco extract has long been well known and well documented against various insect pest including aphids. Tobacco contain nicotine sulfate, which probably deter or kill insects and has been found toxic (Bajpai and Sehgal, 2000; Chari *et al.,* 1996).

Aphid management with neem extract

The number of rose aphids observed on rose plant leaves, buds and flowers by visual sampling treated by neem extract shown in fig. 4, 5, 6. The means compared by LSD test at 1 % level (Table 1) indicated that aphid population significantly decreased with the increase in time. Aphids found on selected rose plant were counted. Alates, apeterous adults and nymphs were counted collectively on rose plant. There were 97,127,124 aphids found on leaves , buds and flowers of selected rose plant. After 12 and 24 hours of treatment of rose plants with neem extract data were collected which show significant reduction in aphid population. The population of rose aphids started decline after 12 hours. The mean mortality of aphid after 12 hours was 50, 55.56, 70 and 62.5, 100, 86.67 after 24 hours of treatment on rose plant leaves, buds and flowers respectively. The treatments other than neem did not differ from each other in this regard 12h after the treatments applied. However, 24h after the application of treatments, aphid mortality caused by neem was significantly greater than the other treatments. The results are in agreement with Koul, (1999) and Saika *et al.* (2000) who reported Neem seed extracts reduced the population of aphid on host plants. Leaf (10-15%) and seed kernel (5%) extracts of neem caused significant mortality of the aphid. Malhotra (1999) stated that population of the aphids was maximum on inner whorl of flowers followed by middle and outer whorls but number of mummified aphids did not differ significantly with respect to position of leave. Field evaluation with formulated neem extracts revealed the effect to be more of growth regulatory nature thereby showing that azadirachtin is a physiological toxin for aphid species

Aphid management with surf solution

The number of rose aphids observed on rose plant leaves, buds and flowers by visual sampling treated by surf solution shown in fig. 7, 8, 9. The means compared by LSD test at 1 % level (Table 1) indicated that aphid population significantly decreased with the increase in time. Alates, apeterous adults and nymphs were counted collectively on rose plant. Aphids found on selected rose plant leaves, buds and flowers were 66, 71 and 124 respectively. After 12 and 24 hours of treatment of rose plants with surf solution data were collected which show significant reduction in aphid population. The population of rose aphids started decline after 12 hours. The mortality means of aphid reduces to 25,28.57,21.05 after 12 hours and 41.67,57.14,31.57 after 24 hours of treatment on rose plant leaves, buds and flowers respectively. Results are similar to Walker *et al*. (1984) who reported that mortality factor with a jet of water is small because aphids usually gather on the protected places under surface of leaves where they are less likely to be washed off. County (1999) reported that sprays of horticultural oil when plants are dormant will help decrease aphid populations and further reported that spray with insecticidal soap is very effective to control aphids.

Table 1

Aphid mean mortality (%) as treated by different treatments in the field on rose plant.

Spray solution Applied	Percent mean mortality					
	On Leaves		On buds		On Flower	
	After 12 Hours	After 24 Hours	After 12 Hours	After 24 Hours	After 12 Hours	After 24 Hours
Tobacco	56.25a	68.75a	37.5a	75a	70a	86.67a
Neem	50a	62.5a	55.56a	100a	70a	86.67a
Detergent	25b	41.67b	28.57b	57.14b	21.05b	31.57b
Control	3c	4c	2c	5c	7c	16c

**significant at 1% level

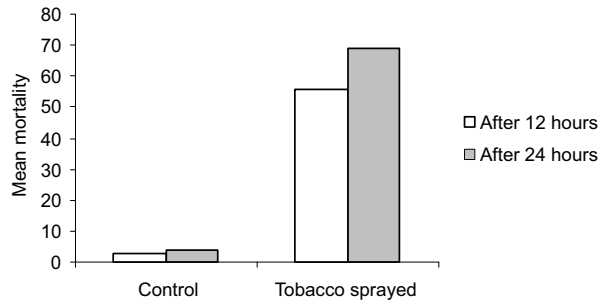

Fig. 1

Number of rose aphid mortality (Mean/plant) observed on rose plant leaves through visual sampling influenced by tobacco treatments.

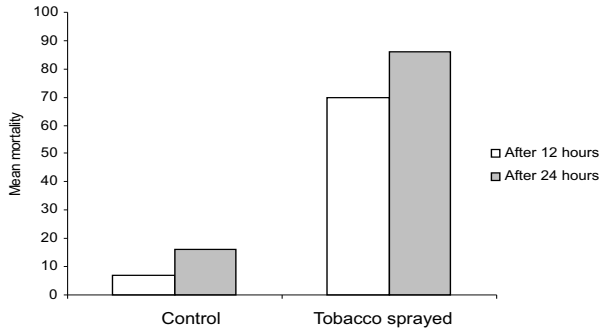

Fig. 3

Number of rose aphid mortality (Mean/plant) observed on rose plant flowers by visual sampling influenced by tobacco treatments.

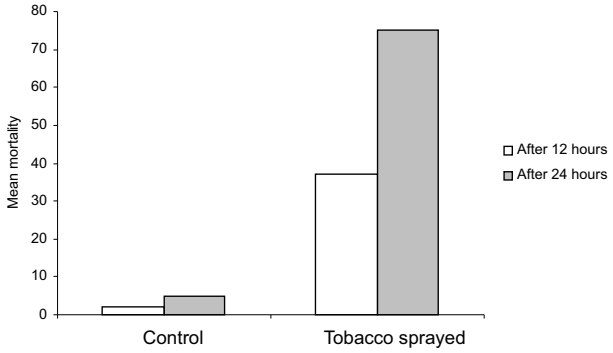

Fig. 2

Number of rose aphid mortality (Mean/plant) observed on rose plant buds by visual sampling influenced by tobacco treatments.

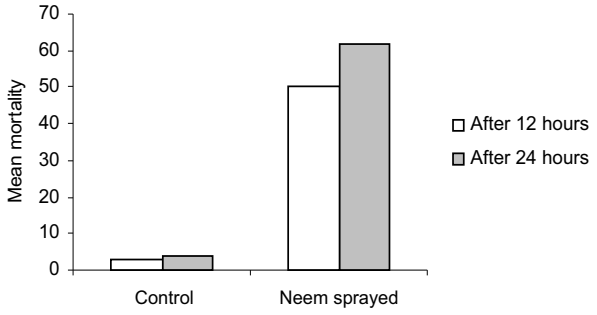

Fig. 4

Number of rose aphid mortality (Mean/plant) observed on rose plant leaves through visual sampling influenced by neem treatments.

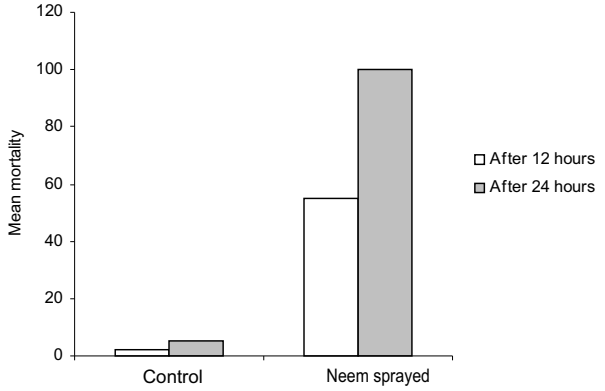

Fig. 5

Number of rose aphid mortality (Mean/plant) observed on rose plant buds by visual sampling influenced by neem treatments.

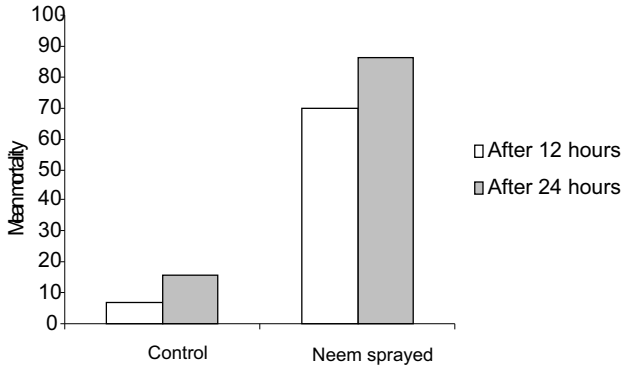

Fig. 6

Number of rose aphid mortality (Mean/plant) observed on rose plant flowers by visual sampling influenced by neem treatment.

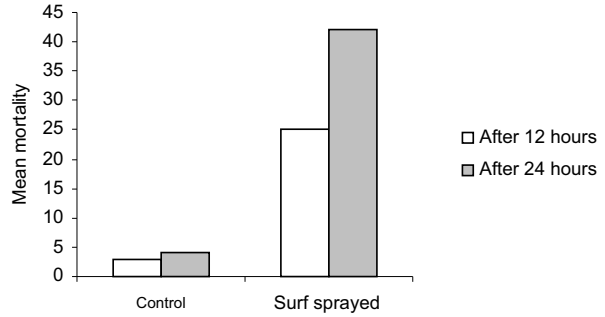

Fig. 7

Number of rose aphid mortality (Mean/plant) observed on rose plant leaves through visual sampling influenced by surf treatments.

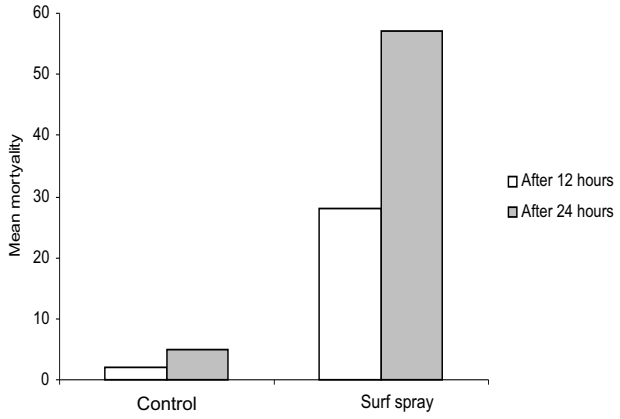

Fig. 8

Number of rose aphid mortality (Mean/plant) observed on rose plant buds by visual sampling influenced by surf treatments.

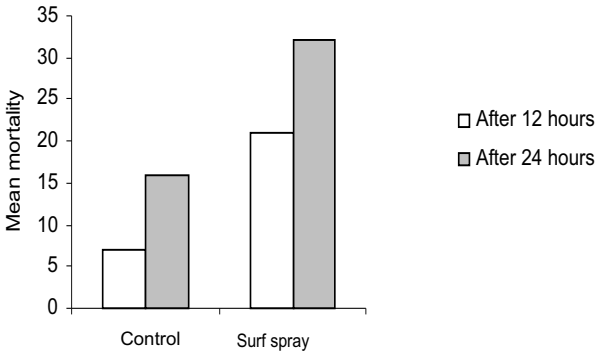

Fig. 9

Number of rose aphid mortality (Mean/plant) observed on rose plant flowers by visual sampling influenced by surf treatments.

REFERENCES

Bajpai, N.K. and V.K. Sehgal, 2000. Efficacy of neem, Karanj and Tobacco formulations against *Helicoverpa armigera* (Hubner) in chick pea crop. Indian J. Entomol., 62: 21-23.

Chari, M.S., U. Streedhar, R.S. Rao and S.A. Reddy, 1996 Studies on compatibility of botanical and microbial insecticides to the natural enemies of *Spodoptera litura* F. Tobacco Res., 22: 32-35.

County, N., 1999. Home Grounds Fact Sheet. Horticulture Program. Cornell Cooperative Extension. Eisenhower Park East Meadow, N. Y.

Datta, S.K., 1997. Ornamental plants and role of mutation. Daya publishing house, Delhi, 220 p.

David, J.S., 2001. Aphids On trees and shrubs, Ohio State University Extension Fact Sheet, Department of Horticulture and Crop Science Fyffe Court, Columbus, Ohio.

Gudin, S., 2000. Rose: Genetics and breeding. Plant Breed., 17: 159–189.

Jayma, L.M.K. and F.L.M. Ronald, 1992. *Macrosiphum euphorbiae* (Thomas) Department of Entomology Honolulu, Hawaii. P. 118-121.

Koul, O., 1999. Insect growth regulating and antifeedant effects of neem extracts and azadirachtin on two aphid species of ornamental plants. J. Bioscie., 24: 85-90.

Lane, G., 2000. Greenhouse IPM: Sustainable Aphid Control. NCAT Agriculture Specialist, ATTRA Publication #IP149/53.

Malhottra, A.S., 1999. Controlling rice aphid under Bangladesh conditions. Pestol. 8: 28.

Murray, B.I., 2000. Plant essential oils for pest and disease management. Crop Prot., 19: 603-608.

Murray, B.I., 2006. Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world Annu. Rev. of Entomol., 51: 45-66.

Saikia, M.P., D. Das and L. Saikia, 2000. Evalutation of botanicals and fish oil formulations against bean aphid, Aphis *Craccivora koch*.. J. Agri. Sci. Soc., 13: 79-80.

Vernon, H.H., 1982. Popular encyclopedia of medicinal plants. Cambridge University Press London. New York, 368 P.

Walker, G.P., L.R. Nault, and D.E. Simonet, 1984. Natural Mortality Factors Acting on Potato Aphid (*Macrosiphum euphorbiae*) Populations in Processing-Tomato Fields in Ohio. Environ. Entomol., 13: 724-732.

Weiss, E.A., 1997. Rosaceae. In Essential Oil Crops. E.A. Weiss, ed (Oxon, UK: CAB International Wallingford), pp. 393–416.

Zuker, A., T. Tzfira, and A. Vainstein, 1998. Cut-flower improvement using genetic engineering. Biotechnol. Adv., 16: 33–79.