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A Preliminary Account of Pests of Apple in Madras

by

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In recent years, apple cultivation is getting an impetus on the Nilgiris and Kodaikanal hills in Madras. A number of pests have been noted attacking the apple and an account of them is given in this paper.

Literature on pests of apple in Europe and America is too voluminous to be cited. Misra (1919) lists about three dozen insects on apple in North India, some of the important ones being *Lymantria obfusca* Wlk., *Euproctis* spp., *Belippa laleana* Mo., *Laspeyresia pomonella* L. and *Myllocerus* *ll. pustulata* Fst., Fletcher (1919) mentions *Lithocolletis gonodes* Meyr. as occurring on apple at Parachinar. Pruthi and Batra (1938) mention SanJose scale, *Quadraspidiotus perniciosus* C., the woolly aphis, *Eriosoma lanigera* H., the codling moth, *Cydia (Laspeyresia) pomonella* L. and a few other pests occurring on the

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apple in the erstwhile North-West Frontier Province. Rahman and Khan (1941) give an account of the biology and control of the woolly aphid in the Punjab. Chotey Singh (1963) deals with the life history and control of San Jose scale in hill orchards. Sharma and Bhalla (1963) mention *Taeniothrips rhopalantennalis* Sh. as pest on apple blossoms in the Himachal Pradesh. In South India, Ramakrishna Ayyar (1940) records the woolly aphid, *Eriosoma lanigera* H., the cottony cushion scale, *Icerya purchasi* M. and the San Jose scale, *Quadraspidiotus perniciosus* C. - all of exotic origin - as also the aphid, *Dilachnus krishnii* G., the apple scale, *Aspidiotus cydoniae* C., and the weevils, *Myllocerus subfasciatus* G. and *Myllocerus maculosus* D. as pests of apple. In the Scheme for Investigations on Pests of Hill Crops at Kodaikanal, some more pests have been detected and observations were made on the two most serious pests, the woolly aphid and the San Jose scale.

Order: Homoptera. The woolly aphid, Eriosoma lanigera H. (Aphididae)

The woolly aphid is the most serious pest met with on apple on the Nilgiris as well as at Kodaikanal. The pest is prevalent through out the year.

Nature of attack: The occurrence of the pest is easily detected by the white woolly patches evident on the tree trunks and stems all through the year. The patches are more conspicuous from May until October, at Kodaikanal. The aphids first invade the wounded portions of the trunk and branches and after getting a foothold, spread to the cracks and crevices of the trunk and branches and even to the roots. The injury causes innumerable irregular galls on the shoots and roots. The damage leads to the decline in the vigour of the tree and eventual death.

Life history and seasonal incidence: Fresh born nymphs introduced on potted young apple root stocks took 19 days for completing the life cycle in February - March, 21 days in September - October and 23 days during December. Winged forms were in evidence from July to September. Wool formation was scarce during the cool weather period. At Kodaikanal the pest population showed an upward trend from May and dwindled in strength by October after the receipt of heavy rains and continued to be low during the cold months.

Incidence on different varieties: Different varieties (10 to 16 years old) grown at the Pomological Station, Coonoor were examined for the incidence of the pest during 1963 and 1964. The varieties, 'Zouche's Pippin', 'Signe Tillisch', 'Irish Peach' and 'Alsops Early' did not show any infestation by the pest during the period of observation. A stray case of the incidence of the pest was met with on 'Carrington'. The varieties 'Winterstein', 'Israel Types 1 to 3', 'Blenheim Orange Pippin' and 'Rome Beauty' were all found infested in

the aerial portion although the root stock, M. 778 did not show the incidence of the pest. The infestation was severe on 'Winterstein', 'Israel Types 1 to 3'. Three sets of trials were conducted against the pest at Kodaikanal.

In trial 1, different insecticides were sprayed on in January 1964, taking one tree (which alone was available) for each treatment in a farmer's holding. The treatments were repeated as and when a further build up of the pest became evident on all the treated trees. The second round of treatment was given in March, 1964 and a third spraying in July, 1964. The pest population remained at a low level till the onset of the north-east monsoon, after which there was a further reduction. The first round of spraying was given using 9 litres of spray fluid per tree while in subsequent sprayings, 13.6 litres were used for ensuring a more through drenching spray, especially at the basal region. The reduction in population of aphids was observed at each round of spraying.

All the insecticides were highly effective in the extermination of the exposed aphids. Methyl-demeton (Metasystox) 0.05 % and azinphosmethyl (gusathion) 0.1 %, followed in the order of efficacy by carbophenothion (trithion) 0.02 % and parathion 0.025 % showed greater residual efficacy than other treatments as seen from the build up of the pest after treatment.

In trial 2, apart from methyl demeton, azinphosmethyl and parathion, three new insecticides—formothion, imidan and phosphamidan—were tried taking a single tree for each treatment and using 13.6 litres of spray fluid per tree. The reduction in the population of aphids was assessed 72 hours after treatment. For observing the residual efficacy, the build up of the pest was examined for two months at monthly interval and the percentage of reduction based on the initial population noted before the first round of treatment was worked.

For immediate kill as well as residual efficacy, azinphosmethyl 0.1 %, formothion 0.2 % and methyl-demeton 0.05 % were superior to other insecticides. The recurrence of the pest was mild under these treatments even after two months.

In trial No. 3, in addition to the insecticides tested in trial Nos. 1 and 2, diazinon 0.025% was also tried, taking one tree per treatment. Carbophenothion was tried at a concentration of 0.06% as against 0.02% in trial No. 1. This was to test it for its reported phytocidal action. In this trial also, azinphosmethyl 0.1 %, formothion 0.2 % and methyl-demeton 0.05 % had shown greater residual efficacy. The recurrence of the pest was least under these treatments, the next best being carbophenothion 0.06 % and parathion 0.025 %. No phytocidal action was noted on the treated trees.

Natural enemies: *Aphelinus mali* H. was found to be prevalent throughout the year, parasitising the aphid. Parasitism ranging from 24% to 69% of aphids was noted at Kodaikanal, the average parasitism recorded during the past two and a half years being 41.48%. The parasitised specimen can be made out by its black colour. The specimens from which the parasites had emerged showed an exit hole on the abdomen of the aphid. A syrphid fly maggot predaceous on the aphid was also met with commonly.

The brown aphid, Lachnus krishnii G. (*Aphididae*): This big-sized aphid was often noted in large clusters on the stems of apple at Coonoor as well as at Kodaikanal, causing sooty mould formation on the infested plants. The time taken for reaching the adult stage from the nymph was 20 days in September - October on potted plants. Sprays of parathion 0.025%, malathion 0.05%, endrin 0.02% and BHC 0.05% were all found to be quite effective for the control of the pest.

The San Jose Scale, Quadraspidiotus perniciosus C. (*Coccidae*): The San Jose scale, was noted on a few apple plants. The pest affects the vigour and growth of young plants by draining the sap. Plants severely infested with scales show an ash-grey appearance. The insects underneath the scale are lemon yellow in colour. Minute whitish round spots are visible on the plants at the places from where the scales have fallen. In light infestations, the bark becomes reddish pink around the places of attachment of scales. Young plants succumb to the injury.

Life history and seasonal incidence: Observations on specimens reared on pumpkin fruit in the laboratory showed that from crawler to adult stage, it took 34 to 38 days during September - December and the time required was 32 days during February-April and 30 days in May-June. The time taken from one generation to the next (crawler to crawler) was 86 days in the laboratory during the cold weather period (November to February) whereas quicker production of crawlers was observed in summer months. The population was higher during the summer months from March to May. In the laboratory too, the population rose to a peak in April-May on pumpkin fruit.

At Kodaikanal, only upto 4% of young apple plants were found infested by the pest, whereas at Coonoor, as much as 8.6% of apple root stocks were found attacked. The pest was noted on 'Keifer' variety of pear too.

Control: Sprays of the miscible oils, Esso Tree Spray and Shell Winter Spray at 2% concentration followed in the order of efficacy, by methyl-demeton 0.1%, formothion 0.2% and parathion 0.05% were effective in the control of the pest in small scale trials conducted against the pest.

Besides the above mentioned pests, the following pests were also noticed:

(i) *The Cottony Cushion scale, Icerya purchasi M. (Coccidae)* (Occasional).

(ii) *Psyllid, Psylla mali S. (Psyllidae)*: Noticed on the tender shoots and leaves of young apple plants at Kodaikanal.

(iii) *Order: Heteroptera. The green bug, Lygus viridanus M. (Miridae)*: Often seen puncturing the tender unfurling leaves and causing their curling. Numerous black spots are formed on the leaves due to the punctures made.

(iv) *Order: Lepidoptera. The Stemborer, Phassus malabaricus M. (Hepialidae)*: The long and stout caterpillar of this big sized moth bores into the basal trunk and girdles the stem. It also attacks pear, plum, peach and other plants too.

(v) *Leaf bud caterpillar, Cacoecia sp. (Tortricidae)*.

(vi) *Hairy caterpillars, Euproctis fraterna M., Porthesia (Euproctis) scintillans W., and Perina nuda F. (Lymantridae)*: The hairy caterpillars of these months assume strength occasionally and eat the leaves. In the early gregarious stage, they scrape the leaves of young apple plants. Parathion 0.025% spray is effective against these caterpillars.

(vii) *The semilooper, Phytometra orichalcea F. (Noctuidae)*: Stray specimens of this caterpillar have been noted eating the leaves of apple plants at Kodaikanal.

(viii) *Cutworms, Agrotis ypsilon R. and Agrotis. C. nigrum L. (Noctuidae)*: The cutworms have been noted crawling up on young apple plants and eating the leaves at night. They hide in the soil during day time. Application of aldrin 5% or heptachlor 6% dust in the soil around the plants will control the pest.

(ix) *Order: Coleoptera. The weevil, Myllocerus suspiciens M. (Curculionidae)*: Young apple plants are severely defoliated by the pest during the months of May, June and July. Sprays of parathion 0.025% and DDT 0.16% were found to be quite effective in the control of the pest.

(x) *The beetle, Minastra costatipennis T. (Chrysomelidae)*: This beetle was noted causing severe defoliation of young apple plants in Nilgiris district.

(xi) *The coppery-brown beetle, Nodostoma pubicolle J. (Eucosmidae)*: This beetle scrapes the leaf and fruit surface and mars the appearance of the fruit as noted at Kodaikanal.

(xii) *The stag beetle, Cladognatha giraffa F. (Lucaenidae)*: The stag beetle was noted eating well-ripe fruits on apple trees at Kodaikanal. The beetles invariably preferred the fruits that have already been affected by the fungus, *Glomerella cingulata*. The attacked fruits look as if they have been damaged by birds. Hand collection of the beetles is easy for adoption.

Apart from the above, certain unidentified pests like a small green aphid infesting tender leaves and shoots, a mite (Tetranychidae) causing the browning of the leaves and another mite occurring in good number in apple flowers have also been met with.

Summary and Conclusion: Pests like *Phassus malabaricus M.*, *Cacoecia* spp., *Perina nuda F.*, *Nodostoma pubicolle J.*, *Cladognatha giraffa F.*, *Mylocerus suspiciens M.*, *Psylla mali S.*, *Minastra costatipennis T.* and *Lygus viridamus M.* have been recorded for the first time on apple in Madras. The most important pest is the woolly aphis *Eriosoma lanigera H.* The SanJose scale, *Quadraspidiotus perniciosus C.*, and the weevil, *Mylocerus suspiciens M.*, though not so serious as the woolly aphis, are to be reckoned as important pests. The other pests, though minor, become serious occasionally. They include the mites, the aphid *Lachnus krishnii G.*, hairy caterpillars and cutworms.

Azinphos methyl 0.1%, formothion 0.2% and methyl demeton 0.05% proved to be the most effective insecticides in the control of the woolly aphis, *Eriosoma lanigera H.* Carbophenothion 0.06% and parathion 0.025% were the next best. No phytocidal action was noted on the trees treated with these insecticides. During the fruiting period, malathion 0.05% is a safe insecticide that can be used as its residual efficacy is less. However, care may be taken to stop the treatment 4 weeks prior to harvest.

The miscible oils, Esso Tree Spray and Shell Winter spray at 2% concentration showed greater promise of control of the SanJose scale, *Quadraspidiotus perniciosus C.* than other insecticides. *Aphelinus mali H.* is a useful parasite on woolly aphis, prevalent both at Kodaikanal and on the Nilgiris.

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Effect of Some Agronomic Factors on the Yield of a Few *Japonica* × *Indica* Rice Cultures

by

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Introduction: A study of response of rice plants to cultural treatments like time of planting under different fertiliser levels is for many reasons a very important problem. With the object of combining fertiliser responsiveness and stiff straw characteristic of the *japonicas*, *indica* × *japonica* hybridization projects were undertaken as early as 1952 and as a result of intensive study of a large number of *indica* × *japonica* hybrids and their derivatives in the succeeding years, a few cultures were found promising. These promising cultures were fixed up for detailed study with different dates of planting and fertiliser levels. The present studies were undertaken at Paddy Breeding Station, Coimbatore with a view to find out differential responses of a few *indica* × *japonica* rice cultures to agronomic factors namely time of planting and different levels of fertilisers as recommended by the Rice Committee of the Indian Council of Agricultural Research.

Material and Methods: Five *indica* × *japonica* rice cultures were tested against the strain ASD11 under two levels of fertiliser doses and three dates of planting in a complex manurial cum date of planting trial with the following treatments.

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