Local farmer practices

Pesticide name	formulation	Application volume per hectare
Propazine	EC57%	1 per 1000
Amitraz	EC20%	1 per 1000 (used when 60-80 percent of the eggs are hatched)
Fenpropathrin	EC10%	2 per 1000
Tetradifon	EC18/5 %	Infiltrates into the plant tissue and affects the eggs or immature mites, indirectly leading to sterility of the female insect
Benzoximate	EC20%	1.5 per 1000
Phenpropathrine	SC5%	0.5 per 1000 (quickly affecting the larvae and mature mites)

Chemical treatment used to be the only way for the local farmers to control this aphid. The following table lists the pesticides used by the local farmers against this aphid in the Project area:

IPM methods

Improvements of orchard hygiene and pest management on the ground to prevent its migration on the tree were the main methods introduced by the Project. The non-chemical insecticide soap Palizan, which was introduced against aphids also proved highly effective against mites. The same dosage (1-2 per 1,000) was applied to control the mite on the weeds under the trees.

A very important finding of the FFS farmers in the Project was that the mites only affected the trees of red apples and not the yellow apples. The farmers made a lot of research to find out the reason. Some of the FFS groups came to conclusion that the mites preferred the red apple trees because red apple trees absorb more heat compared to yellow apple trees. This finding was very important for the participating farmers in making more informed pest management decisions.

Interestingly, the farmers recorded a quite opposite observation on apple mildew. They found out that the mildew preferred the trees with yellow apples. This finding discussed under the section related to apple mildew.

3.2.5 Scaraba beetles (Epicometis hirta Poda *and Oxythyrea cinctella* Schaum*)*

Scaraba beetles overwinter larval under the soil and between the rotting plant materials or the tree trunks and roots. The curled larvae are distinctive from other species for their hairy abdomen. The overwintering larvae are transformed into pupae in early April. Mature insect emerge in early May and attack the flowers and their different parts immediately after emergence.

The population of this scaraba beetle was growing in the Project area due to expansion of colza fields as well as increased use of fertilizers. Its emergence in the season coincided with the peak activity of pollinators, in particular honey bees. When the

local farmers applied pesticides to control the beetle, the population of the bees was also reduced, sometimes resulting in loss of the flowers by fifty percent.

Local farmer practices

Local farmers in the province used only chemical treatment to manage this pest. The pesticide commonly used to control this pest in the Project area is Endosulfan (Thiodan) 1.5-2/1000, usually sprayed one to three times (more in orchards located at the vicinity of dairy farms) per season. Before spraying, the farmers first shake the tree to have the beetles fall off the trees.

IPM methods

A simple observation by the IPM\FFS farmers group in Gerdekaneh Village, Kermansha, led to the introduction of an effective non-chemical strategy to control this pest in the region. During his regular field observations, the group noticed that dead and alive beetles had gathered on a rain-water filled plastic container abandoned in the orchard. Based on this observation, the group, with their Facilitator Mr. Saeed Valad Beigi, made a simple research using half water-filled plastic pans as traps with three different colours (red, yellow, blue).

Beetle feeding apple flower

Three rows of traps were used in two separate orchards. To reduce friction, drops of dish washing liquids were added to the water on 0.05/1000 ratio. They also took into account similar methods that involved using gas oil in white pans instead of water-dish washing liquid in blue pans. The results showed that:

1. The method was highly effective in attracting the beetles.
2. The blue pans were much more effective than the red and yellow pans.
3. The number of mature beetles trapped in one pan exceeded 7,300 in a 10 day observation period. The volume of trapped beetles was so large that each pan had to be cleaned once in every two days.
4. An interesting conclusions was also that the highest number of catches occur between 11:00 am to 16:00 pm, ie. at the middle of the day.

Based on the above results, the method was extended to 50 hectares of apple farmers in Gerdukaneh Village in 2010. Between each couple of apple tree rows, one line of pan traps was installed with 10 meter spacing. Again the results were extremely good and the population of the scarab was effectively controlled without using pesticides. Subsequently, the Kangavar Township Agricultural Management extended this method to 700 hectares of orchards in 2011. For this purpose, a small workshop was established where about 70,000 traps were produced and distributed to the farmers per season. Since blue pans were not available in the market, pans were purchased in any available colour and then painted with blue colour. About 60-80 pans are used per hectare, depending on the density of trees.

Blue water-dish with water trapped the beetles

An economic comparison between chemical control and the newly introduced pan trap method revealed that the latter was more cost effective. The cost of chemical treatment in the project area is about 30-90 USD per hectare, while the blue pan trap application costs only 3-4 USD per hectare.

Mr. Saeed Valadbeigi, a staff of Kangavar Township Plant Protection Office, Kermanshah Province. In 2007, he joined the FAO TCP Project for Sunn Pest as a facilitator after being trained by the Project's TOT Programme. He continued his function as a facilitator under the aegis of the FAO Regional IPM Project in Kermanshah Province. Development and introduction of water-dish washing liquid bait pan trap to control scarab beetle in Kangavar was the result of his close work with the FFS farmers of Kerdukaneh Village, led by orchard farmer Mr. Ghorehjili.

Mr. Saeed Valadbeigi tests the colored traps

Besides this method, the FFS sites experimented orchard hygiene improvement and various mechanical and agronomic methods against this pest, as:

- Depositing animal manure heaps across the orchard to attract the female insects to lay the eggs and burning them in April-May to destroy the eggs.
- Cultivation of trap plants, such as wild mustard and colza in the margins of the orchards to avoid damages to the orchards.

Farmers collecting trapped beetles from the pnas, Kermanshah

3.2.6 Root white grub (*Polyphylla olivieri* Laporte)

The highly polyphage root white grub exists in almost all regions of Iran, feeding on the roots of different plant species, including fruit trees, forest trees, field crops, and ornamental trees. Apples, pears, peaches, plums, prunes, apricots, and cherries are among the main fruit tees affected by this pest in the country. The damage of this pest is even worse in the nurseries. One larva can kill a sapling.

The larvae, up to 9 cm in length, are white in color and they have a curled body, with three pairs of legs and strong mouth pieces. The head is reddish brown. The larval stage takes about three years.

The larvae feed on homos or grass roots in the first generation and on the tree roots in the second and third generations. The larvae are more active in moist soils. They continue damaging until the end of the second month of autumn, and even until the end of autumn in some regions of the country. Then they migrate to deeper in the soil to avoid the cold. Next spring the come back to the top soil and start feeding on roots. It transforms into the adult beetle in the third year, becoming particularly harmful because its appetite is very high.

The mature white grubs emerge from the soil in late June-early July and start feeding on bearing and non bearing trees. All activities of the mature grub, including feeding, mating, and egging start from the sunset. During daytime, the grub lies dormant between the branches and leaves of the trees. Mating occurs 5-6 days after the migration of the mature insects from the soil, most high in August.

The female insect lays its white eggs individually or in six-egg clusters 5-7 centimeters under the topsoil near the root of the host plant. To lay her eggs, the female grub penetrates into the soil with her front legs. Each female grub lays 20-30 legs. The embryo stage takes about one month.

Local farmers practice

To manage this pest the local farmers spray the soil around the trees for three successive years, each season 25-30 days after the emergence of the mature beetles from the soil, which in the selected province usually occurs in late June-early July. A light irrigation is done after spraying.

IPM methods

The IPM\FFS farmers analyzed this pest and concluded that it was not a major problem for their orchards. They examined and adopted the following methods against the pest: Light tapping (together with soap bait water pans), collecting mature insects and larvae, and plowing.

To collect the mature beetles, the FFS farmers spread a paper sheet around the tree and start shaking the tree until the dormant grubs fall on the ground. Another mechanical method introduced through the FFS sites is to install several lanterns in the affected orchards to attract the grubs at nights. Other mechanical methods used in the project was plowing the soil under the trees to collect large and small grubs or releasing chicken to pick them. These methods proved quite effective in reducing the pest population and preventing the trees from dying out.

Agronomic methods mainly include elimination of the annual and perennial weeds in the orchard, as well as plowing the soil in the winter.

3.2.7 Pear & Apple Powdery Mildew [*Podosphaera leucotricha* (Ell.& Evherh) Salm]

Local farmers practice

The common practice against powdery mildew in the project area was to apply recommended fungicides upon observing the first signs of the disease.

IPM methods

The IPM\FFS groups tested a non-chemical fungicide, based on soda ash, at rate of 5/1000 to control powdery mildew. The solution proved to be quite effective.

3.2.8 Quantified role of IPM in reducing the use and cost of pesticides and chemical fertilizers, the case of Damavand Apple Farmers IPM Group

To further compare the technical and economic merits of IPM methods and conventional methods in apples orchard, the key findings of the application of IPM methods by Damavand Apple IPM\FFS Group is provided in the following section.

Comprised of 20 farmers, who together own about 400 hectares of apple farms, Damavand Apple IPM\FFS Group was set up in 2010 by the veterans of the TOT and FFS activities of the RIPM Project. Damavan is a major apple growing area in Tehran Province. Most of apple orchards in Damavand are mechanized and are made of commercial varieties, often oriented for exports. Monoculture, mechanized production and protection, and drip irrigations systems are very common in the area.

The Damavand IPM Group members dedicated 90 hectares as IPM\FFS S pilot site. The findings of this group have had a key role in extending IPM methods in the region. Some of these findings are briefly summarized as follows: