Suggestion of using Imidacloprid for controlling Erythrina gall wasp (刺桐姬小蜂) Infestation in Erythrina variegate (刺桐)

Since December 2006, NEK Chemicals Limited have been treated about 20 Erythrina variegate which infested by Erythrina gall wasp (EGW) in H.K. We also observed the situation of many Erythrina trees in different area in H.K. Besides, we also discuss this problem with the people who are working on controlling the EGW infestation from China and USA.

From our observation, most of the infested trees do not have any treatment at all. Those trees are weakening. Some of them, whole tree are fail, some of them had failed branches. Usually the infested tree went through an ordinary pattern of weakening before fail. Starting for EGW infestation, leaf density become lower, and the new grown branches become shorter. After few years cycle, the tree become weaker, then other pest (insect and fungus) also attack the tree. Finally, the tree fails.

Below diagrams: Erythrina tree located in Shatin Central Park failed in 2007

On the other hand; several trees had been treated. Most of the treatment should be according to the suggestion from Agriculture, Fishery and Conservation Department notice which published on 2005. The suggested treatment is trimming away the infested branches and applying pesticide, such as: malathion and dimethoate to control the EGW. Unfortunately, this method does not work as expected although similar method also used by State of Hawaii, USA. Most of the new branches are infested by EGW. Heavy galling was found on all new grown branches.

歷佳化工有限公司
NEK Chemicals Ltd.
香港新界沙田火炭山尾街 43 - 47 號環球工業中心七樓 14 室
Rm. 14, 7/F, Worldwide Industrial Centre, 43 - 47,
Shan Mei Street, Fo Tan, Shatin, N.T. Hong Kong
Tel: +852 34282669 Fax: +852 37475550
E-mail: info@nek.com.hk Web: www.nek.com.hk

Below diagrams: Heavy Galling found after flush cut

Since 2005, NEK Chemicals Limited has introduced Q-Pest for tree protection purpose. Several trials of using Q-Pest series products (Q-Pest -- wettable powder and Q-Pest-TI -- Tree injection solution) to control the EGW had been done. Those trial reports are published in our web site (www.nek.com.hk). Basically, two methods are employed to treat the trees with pest infestation by Q-pest series products; they are tree trunk injection method and soil application method. These methods detail can be found in out web site also. Both methods have their own advantages and disadvantages. Therefore, selecting an appropriate method depend on the condition of the tree, degree of infestation and the surrounding. The most important is understanding the effect of each application method.

Soil application method is putting the systemic pesticide into soil. When the root of the tree up taking the nutrients from soil, systemic pesticide is also absorbed. With plant translocation system, the systemic pesticide will transport to different parts of tree. NEK make use of the advantage of water soluble packing that, we could simplify the soil drench method to put the whole pack of 10 gram of Q-Pest directly into the holes dug on the ground. The advantages of this method compare with soil drenching are as follows:

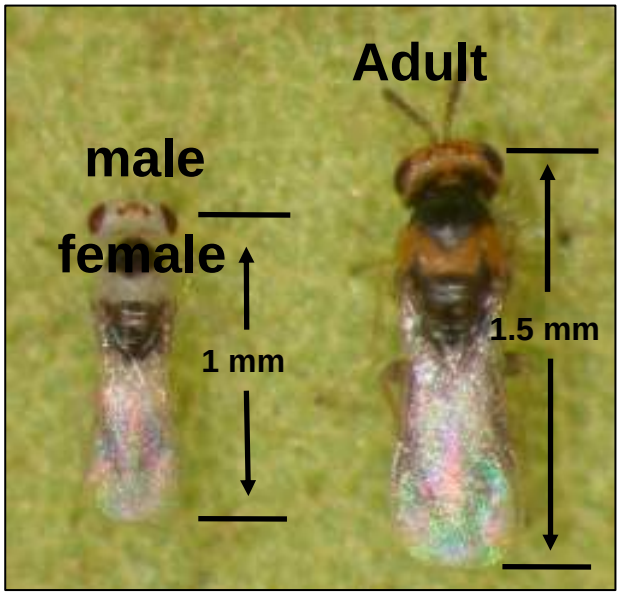
- ✧ No dilution required
- ✧ No direct contact of insecticide
- ✧ Insecticide mixture does not run off to non-target area, less environmental contamination.
- ✧ Do not affected by moisture in soil (insecticide mixture cannot pass into when the soil is too wet when using drenching method)
- ✧ Avoid public contact.

Since the treatment result of both soil application (soil drenching and hole digging) are

very similar, we usually recommend the hole digging method replacing the soil drenching method to the users.

Tree trunk injection method is simply injecting the systemic pesticide into the tree trunk. With the plant translocation, the pesticide will penetrate all parts of the tree and kill the target pest. To make an injection, hole must be made on the tree trunk, high concentration of chemicals (both active ingredient and inerts) go into the tree in a short time. Drill holes create wound on tree trunk; injected chemical create stress on the plant; both increase the chance to damage the health of the tree further.

In the case of controlling Erythrina gall wasp (EGW), we should consider the characteristic of the pest to find the best method to stop the pest. EGW is a flying and very small (>2mm in length) insect. It laid egg into the leaf and young shoot and causing the leaf and shoot deform by galling when larvae appear.



Usually, pesticide with broad target pest spectrum, such as cypermethrin, malathion, imidacloprid or acephate may be considered first. These pesticides can kill the pest by direct contact action or ingestion. That means EGW should be killed if they get in tough with these pesticide. Unfortunately, this is not practical and almost useless if we want to kill the small flying EGW in adult stage. Spraying mist of the pesticide is very difficult to hit the flying EGW. Besides, we have no idea about the favorite food of the adult EGW that the pesticide in bait cannot kill them by ingestion. Therefore, we should shift the target to the larvae stage of EGW. This is because; the mobility of the larvae is very low. They stay in the leaf or shoot tissue and, the plant provide food to the larvae. This is the best situation to eliminate the EGW.

To eliminate the larvae of EGW, we can only apply systemic pesticide such as acephate, dimethoate, imidacloprid and abamectin. Several application method can be applied on tree, they are foliar absorption by spraying on canopy; root absorption by soil treatment and tree trunk injection. Generally in Hong Kong, spray pesticide on the tree canopy is very difficult due to the location and surrounding of the tree creates nuisance and the concern of public safety. Therefore soil treatment and tree trunk injection are the more suitable application methods.

From the study performed by University of Hawaii, they compared the efficacy of different pesticides. They found that the most effective pesticide should be imidacloprid no matter in tree trunk injection and soil treatment method. So, Q-Pest series products which contain imidacloprid is the most suitable pesticide for controlling the EGW by killing it larvae through the plant absorption.

Except using pesticide, trimming all the leafy branches away and destroy the infested branches and leaves is one of the method to eliminate the EGW. However, we have no idea about the number of adult EGW flying around, that, infestation were found when new branches are growing in many cases. Besides, we cannot keep using this method due to heavily damage the health of the tree.

From our previous studies and continuing observation, we summarize the treatments for EGW infestation as follows:

Treatment 1. Tree pruning (flush cut) with pesticide (malathion) spraying
Treatment 2. Tree pruning (flush cut), then soil treatment with Q-Pest
Treatment 3. Soil treatment with Q-Pest only
Treatment 4. Tree injection with Q-Pest-TI only
Treatment 5. Tree injection with Q-Pest-TI and soil treatment with Q-Pest at the same time
Treatment 6. Tree injection with Q-Pest-TI, then soil treatment with Q-Pest one year later
Treatment 7. Soil treatment with Q-Pest, then tree pruning after one month

<u>Treatment 1</u>

We found that Tree pruning with pesticide spraying cannot control the EGW at all. This method only eliminates all the EGW in the pruned tree. The new grown shoot and leaf is the best site for oviposition. Adult EGW come from elsewhere laying eggs in it, and, the galling happen again. Pesticide spraying on the tree cannot last long enough to kill the adult EGW from else where due to rain washed or evaporated destroy by sunlight.

Treatment 2

Once the tree having a flush cut (heavily trimming), the tree is weakening, and metabolic rate will be slow down into a hibernated state. Therefore, pesticide, such as Q-Pest (imidacloprid) is hardly absorbed through the root. When the tree starting to grow a new branch and leaf, there is very little or even no pesticide inside the tree, that the new branch and leaf with very small or even no protection by the pesticide. It is similar to Treatment 1, galling is found.

Treatment 3

When the tree infested by EGW, the leaves are in poor condition and light density. The tree is weakens, and, metabolism is only slow down but continuing in the tree. Soil treatment with Q-pest (imidacloprid), it can be absorbed by the root slowly. Thus, the result of controlling the EGW infestation is not significant. EGW galls are also found. However, in the study performed in Hawaii, the number of adult EGW emergence from galls is going down few months after soil treatment by imidacloprid. This treatment is a slow but work.

Treatment 4

Q-Pest-TI (10% imidacloprid solution) control Erythrina gall wasp significantly with using tree trunk injection method. Even in an unhealthy condition, the tree has a positive result after one month of the treatment with tree trunk injection method. That means tree can be heal from EGW infestation by Q-Pest-TI treatment in many situation.

On the one hand, tree trunk injection with Q-Pest-TI created a stress. New grown leaves were showing burn, yellowing and sometime fallen. That could be caused by the active ingredient, inerts and also the drilling wounds. Besides, drilled holes around the tree trunk create a deep wound on the tree. This kind of wound could not completely heal within few months except the young, strong and fast growing Erythrina.

Treatment 5

This method is combination of Tree injection and soil treatment. The idea of apply this method is reduce the dose rate of tree injection solution into half and replenish the pesticide through the soil treatment method. It shows a very similar result as Treatment 4. The advantage of this combination is reducing the number of drilled wound on the trunk.

Treatment 6

One year after the tree injection treatment, the residual imidacloprid concentration

香港新界沙田火炭山尾街 43 - 47 號環球工業中心七樓 14 室
Rm. 14, 7/F, Worldwide Industrial Centre, 43 - 47,
Shan Mei Street, Fo Tan, Shatin, N.T. Hong Kong
Tel: +852 34282669 Fax: +852 37475550
E-mail: info@nek.com.hk Web: www.nek.com.hk

level is lower inside the tree. The controlling effect of EGW by Q-Pest is reduced and may not kill the EGW larvae. This method is continuing the effect of Q-Pest by soil treatment method without create more drilled wound on the tree.

Treatment 7

This method does not have a proper study. Only one tree has been treated by this method. The result is surprisingly positive. The health of the tree is not good. It is more than 20 years old, light in leaves density and very small in size (around 10cm DBH). Most of the leaves have EGW galls. With soil treatment for one to two months, no improvement has been found. A flush cut was done to eliminate the EGW from the tree and let the tree go into hibernated stage for another one to two months. An unexpected result happened; no gall was found in all new grown branches and leaves, even there are some EGW infestations found on the nearby Erythrina. We think certain amount of pesticide has been uptake before the flush cut. Flush cut concentrate the pesticide in the trunk and no other place to go. When new branches and leaves growing, they get enough pesticide to protect from EGW infestation.

Below diagram: The tree with using treatment 7 on year 2008

We could summarize the effect of the possible treatment methods with the above mentioned experience. Tree pruning with flush cut, spraying pesticide on tree canopy is not practical, No tree has been recover from EGW infestation by this treatment. The remaining treatment methods have their own limitation, advantages and disadvantages. Selecting the best suit method for controlling the EGW is depend on the tree itself, degree of infestation, season (or timing) and the surrounding.

Selection of EGW Treatment methods by Q-Pest in different situation

Situation	Method used
Tree without infestation	Soil treatment for protection if EGW infestation found in the neighborhood
Tree with low to medium infestation	Soil treatment
Tree with heavy infestation	Combine soil treatment (full dose) with Tree injection (half dose)
Tree with heavy infestation	Soil treatment with pruning (not flush cut)
Tree has been flush cut	Tree injection only
Tree base is covered by non-movable material (tile, concrete or stone)	Tree injection only
Tree is very weak (fungus and other insect infestation occur)	Soil treatment, then pruning, low dose (one forth) tree injection step by step depend on the health of the tree. Other pesticide such as fungicide should be used to control the secondary infestation
Tree located on drinking water source such as water well and reservoirs	Tree injection only (no soil treatment should be used)

歷佳化工有限公司
NEK Chemicals Ltd.
香港新界沙田火炭山尾街 43 - 47 號環球工業中心七樓 14 室
Rm. 14, 7/F, Worldwide Industrial Centre, 43 - 47,
Shan Mei Street, Fo Tan, Shatin, N.T. Hong Kong
Tel: +852 34282669 Fax: +852 37475550
E-mail: info@nek.com.hk Web: www.nek.com.hk