

Case Study 3: Successful Area Wide Control Program for Chinese Citrus Fly (*B.minax*) Control

Introduction

Ecoman Biotech, with the support of National Agricultural Technology Extension and Service Center (NATESC) and local government, has implemented Area Wide Control Program (AWCP) for Chinese citrus fly (*Bactrocera minax*) at Shuang Yankou village in Dianjun District, Yichang City, Hubei Province, China.

The local control methods were inefficient in controlling Chinese citrus flies leading to wide spread infestation with an average fruit damage rate of 30-40% in some infested areas.

We have specially designed our Great® fruit fly bait (GFFB) product based on the biological behaviors of fruit flies. By mass baiting with GFFB through our Area wide control program, we have drastically reduced the fruit damage rate to less than 1%. Our innovative AWCP methodology involves proper training, organization, systematic planning, technical support and involvement of the local government bodies.

Our successful AWCP results with reduced fruit damage rate, convinced the farmers to adapt our method of control over other local practices. The effect of our AWCP not only helped local farmers to restore the confidence in growing citrus, but also provided an effective solution for the control of other disease and pest in the whole district.

Chinese citrus fly (*B.minax*) is a pest that made a severe impact on the citrus industry. It greatly affected the citrus growing area which is surrounded by the Yangtze River, in the middle of China.

From the year 2008 to 2011, there was a sharp decline in citrus production due to Chinese citrus fly (*B.minax*). The inferior quality citrus produced made it unsalable as the prices plummeted, which had a negative impact on the citrus industry in the region. As a result, the citrus farmers started to migrate to cities looking for alternative sources of income for their livelihood.

In the year of 2011, we began to promote our AWCP using Great® Fruit Fly Bait (GFFB) across the country in cooperation with the National Agricultural Technology Extension and Service Center (NATESC). In the year 2011-2012, AWCP using GFFB was conducted in the citrus crops in the areas surrounded by Yangtze River. We achieved great success through years of exploration by conducting numerous AWCPs. This paper selects Shuang Yankou village as a classic example of an experimental demonstration in this region to describe our technology and method of control.

In point spraying GFFB we only need to spray 60 points per acre, making it extremely easy to cover large areas when compared to other conventional methods.

Background Information

Located in the Citrus Industrial Zone i.e. the area surrounded by the Yangtze River, Shuang Yankou is a village in Dianjun District, Yichang City, Hubei province (Figure 1). It has 534 citrus-planting farmers and a total citrus acreage of 346 acres. From the year 2008 to 2011, the average fruit damage rate due to Chinese citrus fly reached 30%-40% for 3 consecutive years making it the worst hit village in Dianjun District. Vendors were not willing to buy citrus produced in this village, which in turn badly affected the farmers' source of income. The money

invested on the crop exceeded the returns fetched from it, making it difficult for poor farmers to keep investing.

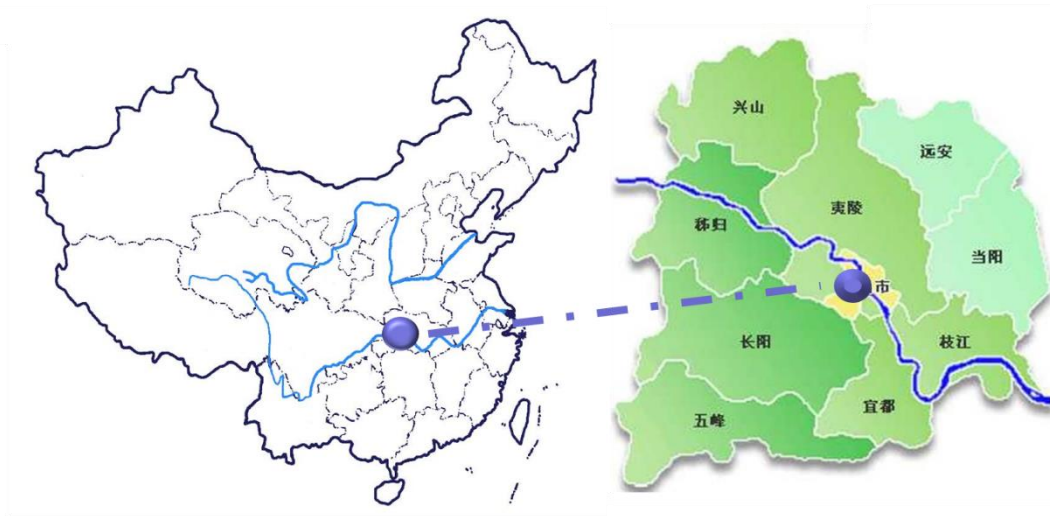


Fig.1.

Location and enlarged view of Shuang Yankou Village shown in blue dots

Wang Yumei was a 52 year old lady farmer who owned 2 acres of citrus crops. (Fig.2) While her husband and son were working in the city as migrant worker, she stayed at home taking care of her grandchildren. Her plot was situated at the border of Shuang Yankou village, close to the mountains. The damage rate due to Chinese citrus fly was more serious i.e. more than 60% in her plot. Due to the heavy presence of maggots in her citrus, none of the traders agreed to buy them. With the situations getting worse for three consecutive years (2008-2011) due to the increasing losses in her citrus plots, she started losing hope for things getting any better. And finally decided to go to the city looking for jobs after April, 2012.



Fig.2 Wang Yumei picking citrus fruits infested by Chinese citrus fly

Implementation of AWCP for Chinese citrus fly

I. The District Government's support

On 12th March, 2012, after several long-term communications with our company, government of Dianjun District held a meeting for the control of Chinese citrus fly in their area (Fig.3). They agreed to support us in conducting an AWCP using GFFB and selected Shuang Yankou village as the trial area. They also partially funded the control program.



Fig.3 Ecoman's officials meeting with Govt. Official, Dianjun District

II. Meeting with the village representative

On 13th March, 2012, the village representatives of Shuang Yankou village held a meeting, where they unanimously agreed to support an AWCP for Chinese citrus fly. (Figure 4). Wang Yumei came to know about our trial and decided to give this a final try just for 1 season, before moving to the city looking for alternate options for her livelihood.



Fig.4 Shuang Yankou village representatives meeting

III. Training to farmers and Sprayer team

On 18th May, 2012, experts from Ecoman trained the villagers and sprayer team (Figure 5). The training helped the sprayer team learn the effective method of GFFB application and also understand our systematic and integrative AWCP approach for fruit fly control. It made the farmers understand the Chinese citrus fly control method and mobilized them to participate actively in supervising the work of the sprayer team for better control.



Fig.5 Ecoman experts training Shuang Yankou farmers (left) & Sprayer team (right)

IV. Monitoring

From May-July 2012, the experts from Ecoman and the local government technical staff together monitored Chinese citrus fly's population density, emergence time, peak feeding time and stage of the fly by studying the pupae from the soil, hanging bait trap and point-spraying (Figure 6), which helped them accurately determine the start and end time of GFFB application for Chinese citrus fly control.

A Checking Pupae	
B Hanging traps with bait	



Fig.6 Monitoring Chinese citrus fly

V. Mass Baiting with GFFB

From June-July 2012, we start applying GFFB by point spray method as per the schedule in Table 1 with the help of the Sprayer team (Fig.7). To ensure that each sprayer operated in accordance with the standard, the organizers trained each operator once again before spraying. The farmers supervised the work of the sprayer team to ensure proper application in the whole trial area.

Table 1 Spraying schedule of GFFB in ShuangYankou Village

First	Second	Third	Fourth
June 13th	June 20th	July 2nd	July 10th



Fig.7 - AWCP in Shuang Yankou Village

On June 13th 2012, Sun Jinsong, Chief agronomist, Yichang city, led a team to conduct a spraying test in Wang Yumei's citrus orchard (Figure 8). Wang Yumei participated actively in the test. There were 2 spraying points in her plot. 31 Chinese fruit flies were found dead after 40 minutes of the 1st spray, 23 of the them being female and 8 male. The results of the spraying and killing experiment gave Wang Yumei more confidence on our control method.



Fig.8- Sun Jinsong, Chief Agronomist, Yichang City with his team in Wang Yumei's citrus orchard (left) & results of flies killed (right)

VI. Fruit damage rate in the citrus orchard

This survey was divided into 2 parts -

- Fruit damage rate when the fruit is hard and green (Green fruit damage rate)
- Fruit damage rate when the fruit is ripened. (Fruit damage rate)

On 25th July 2012, Dianjun District government and Ecoman formed a team and recorded the observations of the green fruit damage rate (Figure 9 & Figure 10). We randomly checked fruits from the 10 different sites. Each site was surveyed by 2 people. Each person randomly picked 500 fruits from 5 trees. As shown in Table 2, data was recorded for 10000 fruits from 10 different sites (1000 from each site), of which 3 sites had a total of 39 damaged fruits and the green fruit damage rate was 0.39%.

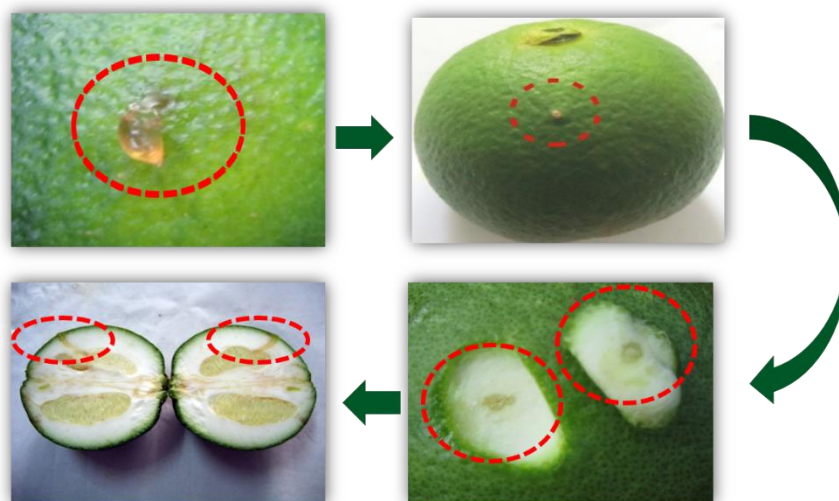


Fig.9 Symptoms / Signs of green fruit damage rate

Table 2 Green fruit damage rate in Shuang Yankou Village

Site	No. of sample fruits	No. of damaged fruits	Fruit damage rate (in %)
1	1000	0	0
2	1000	4	0.4
3	1000	0	0
4	1000	18	1.8
5	1000	0	0

6	1000	0	0
7	1000	6	0.6
8	1000	0	0
9	1000	11	1.1
10	1000	0	0
Total	10000	39	0.39%



Fig.10. District government official examining the fruit damage rate at Shuang Yankou Village

In September 2012, a team of agricultural experts from provincial, city and county levels examined the fruit damage rate of Chinese citrus fly (Figure 11). Results are as below (Refer Table 3)

No. of Sites	Sample size of fruits (in kgs)	Fruits damaged (in kgs)	Fruit damage rate (in %)
10	2500	8.4	0.34%



Fig.11 Team of Agricultural experts from provincial, city and county levels examined the fruit damage rate

The investigation showed that till 29th September 2012, Wang Yumei harvested 11000 kg of

citrus fruits and earned around 4516 USD. (Table 4) Our successful trial prevented her and many other farmers from migrating to cities looking for alternative options of income for their livelihood.

Table 4. Comparison in productivity & revenues before and after trial in Wang Yumei's citrus orchard

	Productivity (in kgs)	Revenues (in USD)
Before trial	1000	323
After trial	11000	4516
Difference	10000	4193

Our AWCP for Chinese citrus fly at the citrus orchards of Shuang Yankou village, for just one season, drastically reduced the fruit damage rate and increased harvest by more than 3 tonnes which is equivalent to an increased revenue of 968-1129 USD.

Factors influencing the effect of AWCP

We have conducted numerous successful AWCPs in the Citrus Industrial Zone i.e. the area surrounded by the Yangtze River. With years of experience, we have classified the important factors influencing AWCP as below:

i) Good Technology

A good technology is the base for an effective trial. Point-spraying of GFFB saves labor and time. It is highly cost effective when compared to the conventional methods. It is an environment friendly solution leaving no residues on the crops.

ii) Systematic Organization and Right Usage

It plays a crucial role in a successful AWCP. Few organizers of the demonstration did not understand the importance of organizing the end users, providing them the right training explaining the right method/time/point of application. They even ignored the importance of monitoring the results of the trial. This resulted in an unorganized and uncoordinated action from the end users leading to high fruit damage rate.

The mode of selling GFFB through distributor channel did not fetch great results. The reason being lack of proper guidance and training on the product usage and organization to the end users also leads to poor results.

iii) Support from the Government

Government initiated promotional campaigns to create awareness, a dedicated team of officials for organizing and financial support to share farmers' burden- are the key aspects we look at, as support from the Government. Government involvement plays a key role in reaching to the masses and winning their confidence.

iv) Active participation of the farmers

The battle against the most economically significant pest - Chinese citrus fly can only be won with the combined support from all the end users. Since, it is always a challenge to organize farmers owning small fragments of land, it is important that they perform unified action to fight

the common problem. It is also important for them to supervise/monitor the action of the sprayer team to ensure better control. Personal grudges if any with the sprayer team should not affect the spraying activity in the trial area leading to poor results.

v) Various marketing activities for farmers

Farmers are always inclined to adhere to old habits of pest control. There is also an inhibition to try something new. In order to persuade them to support and participate in our AWCP, we need to use various promotional channels for making it easy for them to understand. It includes educative videos, posters, leaflets, text messages and other technical service training sessions (Fig.12).

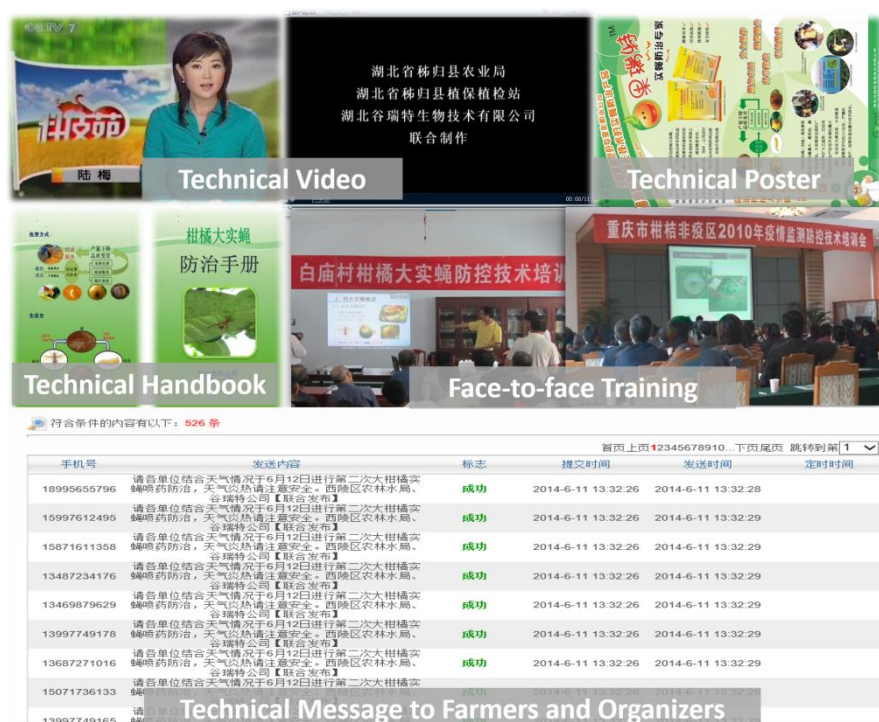


Fig.12 Various promotional channels for farmers

vi) Monitoring

Scientific monitoring can help us accurately determine the start and end time of GFFB application for Chinese citrus fly control. The right time of application is extremely important for effective control of the fruit damage rate.

Latest developments

- From 2012- 2014, the coverage area of AWCP for Chinese citrus fly in Dianjun District increased from 10% to 95%.
- Through our AWCP the average fruit damage rate in the region was below 0.3%, hence protecting the citrus industry.
- Many farmers like Wang Yumei in Shuang Yankou village recorded good yields from their citrus orchards and earned enough for a living. They no longer migrated to cities looking for jobs.
- Our AWCP model has set an example for many cooperative organizations, who have started to provide specialized AWCP services to farmers by their team of experts. They provide comprehensive solution for pest prevention and control to the farmers.