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PROGRESS REPORT NO. 1

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Project Number: CS 1-27

Title: Genetic Improvement of Natural Enemies For Biological
Pest Control: Selection for Resistance to Pesticides
in Species of Aphytis.

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BACKGROUND

The Project became operational in the Philippines in August, 1987. The main objective of this collaborative research project for the period covering August, 1987 to December, 1988 was to collect wild population of Aphytis from the Philippines and shipment of these collections to Israel and mass rearing of Aphytis parasites in the laboratory.

ACCOMPLISHMENTS

Extensive survey and collection of citrus scale insects specifically Florida red scale, Chrysomphalus aonidum (Linnaeus), California red scale, Aonidiella aurantii (Maskell) and also of coconut scale, Aspidiotus destructor Signoret and its Aphytis parasites were done in different citrus and coconut growing areas in the country. Shipments of scale insects which are presumed to be parasitized by Aphytis were made from the Philippines to Israel.

The different areas surveyed for the presence of Aphytis species parasitizing Florida red scale (FRS), California red scale (CRS) and coconut scale (CS) in citrus and coconut plantations are listed in Table 1. Among the citrus farms surveyed, Blossom farm in Bansud, Oriental Mindoro; Villanueva's farm in Bayombong, Nueva Vizcaya and those in Masapang, Victoria, Laguna had the highest degree of scale infestation specifically FRS. Many Aphytis emerged from citrus fruits and leaves infested with FRS and CRS collected in Oriental Mindoro and Masapang, Victoria, Laguna. In contrast, no Aphytis emerged from scales collected in Nueva Vizcaya. Those having moderate scale infestation include citrus plantations located in Matala-tala, Mabitac,

Table 1. Locations surveyed for the presence of citrus scale insects and its Aphytis parasites.

Place	Scale Insects ^a	Degree of scale Infestation ^b	<u>Aphytis</u>
A. Citrus Plantations			
1. Bo. Putho, College, Laguna	Absent	-	-
2. Mt. Makiling, College, Lag.	Absent	-	-
3. Bo. Bagongbayan, Sta. Maria, Lag.	Absent	-	-
4. Bo. Talangka, Sta. Maria, Lag.	Absent	-	-
5. Bo. Macinao, Sta. Maria, Lag.	Absent	-	-
6. Bo. Masiit, Calauan, Lag.	Absent	-	-
7. Bo. Limao, Calauan, Laguna	Absent	-	-
8. Nursery, Calauan, Laguna	FRS	Moderate	Absent
9. Lobo's Farm, Victoria, Lag.	FRS > CRS	Slight	Present (+)
10. Masapang, Victoria, Lag.	FRS >> CRS	Heavy	Present (+++)
11. Bo. Matala-tala, Mabitac, Lag.	FRS >> CRS	Moderate	Present (++)
12. Sta. Veronica, San Pablo City	Absent	-	-
13. Balete, Batangas	Absent	-	-
14. Sto Tomas, Batangas	FRS	Slight	Absent
15. BPI, Lipa City	Absent	-	-
16. Blossom Farm, Or. Mindoro	FRS > CRS	Heavy	Present (+++)
17. MHC, Alcate, Or. Mindoro	FRS	Slight	Absent
18. Villanueva's Farm, Bayombong Nueva Vizcaya	FRS	Heavy	Present (+++)
19. San Marcelino, Zambales	Absent	-	-
B. Coconut Plantations			
20. BPI, Tiaong, Quezon	Absent	-	-
21. Danao City, Cebu	FRS	Slight	Present (+)
22. Davao City	FRS > CRS	Slight	Present (+)
23. NCPC, UPLB	CS	Slight	Present (+)
24. Makiling School, UPLB	FRS < CS	Moderate	Present (+++)
25. Sta. Veronica, San Pablo City	CS	Slight	Present (+)

^a FRS = Florida Red Scale
CRS = California Red Scale
CS = Coconut scale

^b Slight = 1-10 scales/leaf
Moderate = 11-49 scales/leaf
Heavy = \geq 50 scales/leaf

Laguna and Lamot, Calauan, Laguna. Few Aphytis emerged from scales collected in Mahitac while none emerged from scales collected in Calauan. Citrus farms from Santo Tomas, Batangas; MHC, Alcate, Oriental Mindoro and Lobo's farm in Victoria, Laguna had slight scale infestation and it was only in the latter where Aphytis emerged from scale-infested leaves.

Citrus leaves with FRS were brought to Israel by Professor David Rosen (Program Coordinator) during his visit in the Philippines (October 1987) for parasite emergence, identification and possibly for initial mass rearing. Further shipments were made from the Philippines to Israel. In one of the shipments, they were able to recover about 12-15 live Aphytis, unfortunately, no offspring were recovered. Lately, many Aphytis emerged from FRS collected from Masapang, Victoria, Laguna. Mass rearing is now being done in the laboratory using CS and FRS. A shipment of this collection was made last November 11, 1988. There has been no response yet whether the parasite was recovered in Israel. The parasite probably belongs to the lingnanensis group based on pupal coloration. It resembles A. lingnanensis Compere in that both the thoracic and abdominal sterna of the pupa are pigmented. However, the degree of pigmentation differs towards the caudal portion. Also, the host of this Aphytis is FRS and the sex ratio was 70:30 (♀ : ♂). Other studies such as the life cycle, reproductive potential, time and peak of emergence, longevity, etc., are being done in the laboratory.

The A. lingnanensis which were brought to the Philippines by Mr. Pio M. Javier (Study Leader) upon his return from a six-month training in Israel are now being reared in the laboratory using CS. The adult sex ratio was 60:40. The FRS was also tried as host of the wasp. However, few Aphytis emerged and the size of the parasite was greatly reduced from 0.93 mm to 0.72 mm in the females and 0.87 mm to 0.52 mm in the males. The emerging adults

were subsequently allowed to parasitize FRS but no more Aphytis were able to emerge. With regards to CRS, they are difficult to rear in squash, hence, they are not utilized for Aphytis rearing.

As indicated in Table 1, some coconut plantations were also surveyed for the presence of scales (FRS, CRS, CS) and Aphytis parasites. The emerging wasps from scales collected at UPLB were reared in the laboratory using CS. The adults differ from those collected from citrus in Masapang, Victoria, Laguna which are paler and smaller and the pupae are not pigmented. Since FRS was found together with CS, it was tried also as host of this species of Aphytis. Although they could successfully parasitize FRS, the resulting offspring were smaller as compared to those reared in CS, and the sex ratio was shifted from 80:20 (♀ : ♂) to 10:90. Since FRS is an unfavorable host, the wasps probably tend to lay more male eggs.

The native squash, Cucurbita maxima is being used for scale rearing. Unlike the sukini-type being used in Israel, it is bigger and somewhat flattened, hence, less surface area is exposed for scale development. They are difficult to handle and easily rotten because most of the squash available in the market are ^{not mature and} slightly injured. Fortunately, the seed producer upon request sent seed samples of the butternut-type hybrid variety last December 1, 1988 and it is hoped that it could be successfully grown in the Philippines for parallel rearing of scales and Aphytis.

Initial release of A. holoxanthus DeBach in FRS-infested citrus orchard in Bayumbong, Nueva Vizcaya was made. However, the parasite was not recovered probably due to the occurrence of heavy rainfall after release. Likewise, A. lingnanensis was released in snow scale- (Unaspis citri Comstock) infested citrus at UPLB

last November 22, 1988. Further studies on the establishment of this species on snow scale is being done.

IMMEDIATE WORK PLAN

Additional shipments of FRS from the Philippines to Israel will be made.

Native Aphytis will be continuously mass reared in the laboratory using CS and FRS and will be screened for variability in response to pesticides used in citrus.

Selection of Aphytis for substantial level of resistance to pesticide used in citrus will be done.

Dr. Abraham Havron is coming on January 6, 1989 to help us start the selection process.