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Biannual Progress Report

CDR-AID Grant # C7-077

(DPE-5544-G-SS-7009-00)

Title: Identification and characterization of genetic strains in whiteflies

Principal investigators:

Israel: Prof. David Wool

Prof. Dan Gerling

CIAT, Columbia:

Dr. Barry Nolt

Dr. Anthony Bellotti

Dr. Francisco Morales

Date: January 15, 1988

2/11/88

First report

Period covered: July - December 1987

Activities:

1. Planning and co-ordination of the project with the CIAT participants.

In August, 1987, D. Wool visited CIAT at Cali, Columbia and spent 4 days at the research station. He talked with each of the three Columbian scientists and with the Chairman of CIAT, Dr. Laing. He also visited the research facilities at CIAT. Finally, a meeting of all participants was assembled and detailed plans of operation were worked out, including the methodology of sampling in both countries, preservation of the whiteflies and preparations for electrophoretic analysis.

Upon his return to Israel, D. Wool assembled a number of protocols for whitefly electrophoresis which were adapted for Bemisia at his laboratory, and sent them over to CIAT so that work in both countries could proceed using the same techniques.

2. Collection of samples in Israel.

About 100 samples of B. tabaci, and a small number of samples of other whitefly species, have been collected so far in Israel. The samples are from 14 localities and 16 different host plants. Adults were aspirated from the plants and deep-frozen. Leaves bearing pupae were collected and held in holding cages until adults emerged, which were then deep-frozen.

3. Electrophoresis of B. tabaci in Israel.

More than 1200 adults of B. tabaci have so far been analyzed for variation in one enzyme system (Esterases). A strongly-staining locus was found segregating for at least 2 alleles in the sampled populations. Allele frequencies were not the same in all populations, with an indication of a possible geographical trend, but so far no host-race differentiation has been detected. In addition to the major Esterase locus, a number of weaker, less-frequent isozymes were found.

4. Other enzyme systems.

Efforts to improve staining procedures for more enzymes yielded four more systems which stain successfully in individual B. tabaci.

5. Work at CIAT

The progress report from CIAT has not reached us yet. When it arrives, it will either be sent separately or incorporated into the second biannual report.

BIANNUAL PROGRESS REPORT #2

CDR-AID Grant # C7-077

(DPE-5544-G-SS-7009-00)

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C7-077

Title: Identification and characterization of genetic strains in whiteflies

Principal Investigators: Israel: Prof. David Wool
Prof. Dan Gerling

CIAT, Colombia:

Dr. Barry Nolt

Dr. Anthony Bellotti

Dr. Francisco Morales

Date: 15 June 1988

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Second report

Period covered: January-June 1988

Activities:

1) Collection of samples in Israel

Whiteflies are scarce in Israel in the winter, but an effort was made to search for and collect samples of overwintering populations to see if genetic changes accompany the seasonal changes in abundance. In all, about 60 samples were obtained (in addition to the 100 collected last summer). The majority were samples of Bemisia tabaci, but a small number of samples of Trialeurodes vaporariorum, Dialeurodes kirkaldyi and Dialeurodes citri were also collected.

2) Electrophoretic analysis of B. tabaci in Israel

Four enzyme systems are being used at present in the electrophoretic analysis of Israeli whiteflies. So far the best system is esterase, as mentioned in the first report. Our previous interpretation of the main esterase pattern, as being controlled by one locus with two alleles, seems to be confirmed when the number of individuals tested exceeds 3000. Our statement in the first report, that no host-related differentiation was detectable, also remains valid, as well as the presence of some geographical differences in the frequencies of the two alleles.

The other enzyme systems are less informative. Malate dehydrogenase (MDH) shows sex-related differences, but is so far monomorphic within each sex. Alpha-Glycerophosphate dehydrogenase (α -GPDH) and Phosphoglucose Isomerase (PGI) show no detectable variation among individuals. One problem with staining for these enzymes is that activity is lost rather rapidly during storage at -20°C .

3) Data storage and analysis (Israel)

According to plan, a PC computer was purchased for the project and arrived three months ago. Subsequently, all the data collected so far on

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Israeli whiteflies has been stored in the computer, and the calculated values of isozyme frequencies are automatically adjusted when new samples are added.

4) Insecticide resistance estimates (Israel)

Preliminary attempts were made to estimate the level of insecticide resistance in B. tabaci adults; the technique (suggested by Dr. V. Löttrich, CIBA-GEIGY, Switzerland) is based on esterase activity levels. Whitefly homogenates are applied to filter-paper which is then immersed in a solution of the substrate and the stain. These experiments will continue this summer.

5) Sample collection and electrophoresis in Colombia

At CIAT, considerable work had been carried out in the last 6 months. Six whitefly species were collected on about 15 host plants. Samples of all species were run electrophoretically and stained for esterases, using the same protocols used in Israel. The emphasis has been on two species, B. tabaci and B. tuberculata, but some Trialeurodes variabilis, T. vaporariorum, Aleurotrachelus socialis, and Aleurocanthus woglami were also analyzed.

B. tabaci was collected from different host plants and from several localities in five Departamentos (regions) of Colombia. Six enzymes were analyzed: Esterase (EST), Aldehyde oxidase (AO), Xanthine dehydrogenase (XDH), Acid phosphatase (ACPH), Malate dehydrogenase (MDH) and Malic enzyme (ME). The two latter systems do not yet give good staining. EST is the only polymorphic system detected so far. AO is monomorphic within B. tabaci and B. tuberculata but the isozyme pattern is not the same in the two species. ACPH does not stain at all in B. tuberculata. XDH appears identically monomorphic in both species.

The main esterase pattern, as in Israel, seems to be controlled by one gene with 2 alleles. However, there are some dissimilarities between the Israeli and Colombian patterns, and a decision about the genetic similarity of

B. tabaci from the two countries can only be made when samples are run side by side on the same gels.

6) Species-specific patterns

The electrophoretic patterns of the species so far examined are distinctly different, both in Israel and in Colombia. This method may be conveniently used to identify the species in the adult stage, which presents difficulties to conventional taxonomists due to the morphological similarity of the adults of many species.

7) Rearing experiments

In Israel, attempts to rear colonies of B. tabaci on different host plants (other than the standard cotton seedlings) will be made this summer, using a single field-collected source population. The frequencies of esterase isozymes will be monitored to watch for host-related differentiation.

8) Cooperation

Taking into account the geographical distance between Israel and Colombia, it must be pointed out that communication between CIAT and TAU is quite satisfactory. During the last 6 months, several exchanges of information took place between the two laboratories, including short summaries of the research, photographs of the gels, and advice on methodological difficulties. We hope that the flow of information will continue.

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