



**STANDARDIZATION OF *Ceratitis capitata* Wied. (DIPTERA:  
TEPHRITIDAE) FEMALE TRAPPING FOR USE IN  
STERILE INSECT PROGRAMMES —  
CATAMARCA, ARGENTINA, 1995 - 1997**

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**Abstract**

The main objective of the study was to assess *Ceratitis capitata* Wied. (medfly) female trapping with new traps and attractants in varying ecological conditions as part of a co-ordinated international programme. Trials were carried out between 1995 and 1997, using seven types of traps baited with the various combination of sexual and food attractants. Different methods for insects retention were also tested. For these trials, protocols established by the International Atomic Energy Agency were followed. The Jackson Trap with Trimedlure plugs proved to be the most efficient for capture of medfly males, while International Pheromone's McPhail Trap was the most efficient for the capture of females, when used with a combination of all three new attractants (FA-3) consisting of ammonium acetate, putrescine, and trimethylamine plus the toxicant DDVP for insect retention. The new traps and attractants also captured flies belonging to genus *Anastrepha* (Diptera: Tephritidae).

**1. INTRODUCTION**

Sterile Insect Technique (SIT) control is a strategy that uses sterile insects to provide autocidal control of the same species. This is the most advanced technique known to control the medfly and it is used as part of an Integrated Pest Management program.

Successive releases of sterile males can reduce the wild insect population because sterile males will mate with wild females but there will be no viable progeny. At present in Argentina, sterile females are also released, and, can cause some fruit damage due to oviposition.

Advances in technology in SIT for medflies has made it possible to produce genetic sexing strains where only males are produced for field release. This technology has yet to be implemented in Argentina.

Monitoring is not a method to control pests in itself, but is a procedure to estimate insect field populations both quantitatively and qualitatively. However, large numbers of traps in the field will capture a large quantity of flies and this will have a limited effect on the pest population. For medfly, the principal method of monitoring field populations is with a Jackson Trap baited with Trimedlure (JT, TML). To date, this procedure is the most efficient and internationally accepted, but it captures predominantly males.

Because medfly females, both feral and sterile, can damage fruit, if advanced SIT programs were implemented, then there would be fewer females and the sterile males would have greater chance to mate with feral females. However, to date, there has been no improvement in trapping systems to monitor female medfly populations. For this reason, the IAEA supported the development of a new method of trapping to be used in conjunction with advanced SIT programs where male only strains are used.

The purpose of this work, carried out between 1995 and 1997, was the evaluation of different traps and attractants for capturing *C. capitata* females.

## 2. GENERAL EXPERIMENTAL CONDITIONS

### 2.1. General protocol

All trials were performed according to the IAEA protocol, with the only modification that the traps were placed in the northeast side of the plants and not the southeast because of Argentina's geographical position in the Southern Hemisphere. For statistical analysis the number of medflies captured were also transformed according to the IAEA protocol.

### 2.2. Characteristics of the region

The trials were carried out in Fray Mamerto Esquiú and Capayán, which, together with the Capital and Valle Viejo, constitute what is called the Central Valley of Catamarca. They are a Phytogeographical region known as Arid Chaco. The Central Valley has the following surface area: Capayán - 3.837 km<sup>2</sup>; Capital - 648 km<sup>2</sup>; Fray Mamerto Esquiú - 280 km<sup>2</sup>; Valle Viejo - 540 km<sup>2</sup>.

No sterile insects are set free in the area.

The area of study is located to the south of the Province of Catamarca, between 28° 20' North Latitude, 28° 65' South Latitude, 66° 15' West Longitude and 65° 45' East Longitude. It is limited by the Sierra de Ambato to the West and the Sierra de Ancasti to the East and altitude above sea level varied between 430 to 660 m.

The climate is arid temperate. Winds are predominantly from the north-northeast with a 90 % frequency and are more intense from August to October at a rate of 30 km/h, and sometimes 110 km/h. Most rainfall occurs during summer and fall, decreasing from north to south and oscillates between 250 and 450 mm annually.

Forests with xerophilous trees are predominant.

In general, soils develop on medium texture sediments among them loess accumulation. Aridisols and Entisols prevail. They are characterized by their low capacity for water retention, low tenor of organic material and an important sand fraction. They are deep soils, without layers that may interrupt the passing of water or the growing of roots. Their main disadvantage is erosion by wind or water.

There are differences between Fray Mamerto Esquiú and Capayán; the first is slightly more humid because it is a valley surrounded by small elevations such as Sierra Graciana to the east and Fariñango to the west. There are also differences in the soil, with that of Fray Mamerto Esquiú being stonier.

The climatic characteristics for the years 1994-97 are shown in Tables XII - XV. They were provided by the Meteorological Station of the National Institute of Agricultural Technology (INTA) in Valle Viejo.

## 3. FIRST STAGE - 1995

### 3.1. Materials and methods

The trial took place on two farms in Capayán, one located in Huillapima, and the other in Capayán, on Route N° 38. The beginning of the experiment coincided with the period of low rainfall in the Province of Catamarca and the decrease in the population density of medfly and other tephritid fruit flies. The experiment was conducted from March 28 to June 2, 1995.

Site 1 at Huillapima (Capdevila's plot) contained a crop of mandarin (*Citrus deliciosa* Tenora, variety Común (Common) or Criolla (Native)). Trees were 15 yr old. The area of plantation was 24 ha at an altitude of 440 m. There were also 53 grapefruit trees (*Citrus paradisi*) interspersed with mandarins, to the east side of the farm and they were in full production.

Site 2 at Capayán (Cacciato's plot) also contained a crop of mandarin (*C. deliciosa*), variety Common or Native (Criolla). Trees were 15 yr old. The area of plantation was 13 ha at an altitude of 425 m. This farm had a small collection of citrus, with the following species: mandarin (*Citrus reticulata*), orange (*Citrus sinensis*), grapefruit, and lemon (*Citrus limon*) with only two plants of each variety.

The distance between farms was 11 km. Plantations chosen were representative of the area. Generally, no pesticide treatments were applied. Unfortunately, at Capayán, Supracid (Metidathion) was applied against *Aonidiella aurantii* Maskell (Homoptera: Diaspididae) on April 8, 9 and 15, despite an agreement not to apply chemical treatments. Besides, the pest population density did not justify the treatment and it was not carried out at the right time.

To capture *C. capitata*, the JT and the CBDT were compared. The JT were baited with TML and contained a white sticky insert. The CBDT had a green plastic cylindrical body and was baited with FA-2 attractants and contained a toxicant squares for insect retention.

Statistical design consisted of five lines (A - E) with four traps in each. Trap types were alternated (e.g. JT, CBDT, JT, CBDT). They were inspected twice a week and, following each inspection, the traps were rotated sequentially.

At Huillapima, the rows were 56 m apart and the traps 28 m apart in each row. At Capayán, the distance between rows was 54 m and between traps 25 m.

### 3.2. Results

The captures for each type of trap, expressed as total numbers, and the number of flies per trap per day (F/T/D) for each site are indicated in Tables I and II. Four trial were conducted during 1995: March 28 to April 11; April 14 to April 28; May 2 to May 16; and May 19 to June 2.

Upon evaluation of the traps, it was found that of 86 medflies, 83.7 % were captured by JT, TML (82.5% males and 1.2% females) and 16.3 % were captured by CBDT, FA-2 (3.5% males and 12.8% females). Of the total medflies captured, 47 (54.6 %) were taken at Huillapima and 39 (45.3 %) at Capayán. Of 47 medflies at Huillapima, 38 (80.8 %) were collected in JT, TML - 37 (97.3 %) were males and one was a female (2.6 %). In CBDT, FA-2 traps, 9 medflies were captured (19.1 %) - 6 females (66.6 %) and 3 males (33.3 %). Of the 7 females, 85.71% were captured by CBDT, FA-2 and 14.29% by JT, TML. In total, 39 medflies were collected at Capayán. Of these, 34 (87.1 %) were captured in JT, TML and all were males (100.0 %), whereas 5 (12.8 %) were captured in CBDT, FA-2 and all were females (100.0 %). Infestation percentage was determined once a week in the 53 grapefruit trees at Huillapima, by sampling 10 fruits at random. The infestation rate was always zero. The infestation rate in mandarin (10 fruit average) was also zero.

At Capayán, in mandarin, only at the April 14 sampling was a 10% infestation noted (10 fruit average sample size). In the collection of citrus, the infestation percentage was estimated visually, due to the low number of plants and because there was no authorization from the owner to take fruits. Here the infestation percentage was estimated as follows: orange - 25 %; grapefruit - 15 %; mandarin (*C. reticulata*) 5 % and lemon - 0 %.

### 3.3. Discussion and conclusions

Field trials were carried out in two mandarin (*C. deliciosa*) plantations only 11 km apart (Huillapima and Capayán), so the climatic and ecological conditions were similar.

The only tephritid fruit fly captured in the trial was *C. capitata*.

Although the period of study was short, the JT, TML captured more flies than the CBDT, FA-2. There was a strong correlation between daily mean temperature and the number of medflies captured (data not shown). This can also be seen in Table I during Period 1 (March 3 - April 11) when 32 *C. capitata* were captured, which represented 37.21 % of the total number, decreasing to 25.58 %, 22.09 % and 15.11 % during periods 2 - 4 (April 14 - 24; May 2 - 16; May 19 - June 2, respectively). During Period 1 the highest daily mean temperatures were recorded.

Towards the end of the period under study, medfly populations tended to increase, and this coincided with an increase in the daily mean temperature. Fruits were also near harvest time.

Temperature is a very important factor because the higher the temperature, the more medfly activity and the more evaporation of the attractant.

TABLE I. *C. capitata* CAPTURED (TOTALS AND F/T/D) AT HUILLAPIMA AND CAPAYÁN IN MANDARIN (330 TRAP DAYS) (03/28/95 - 06/02/95)

Date	HUILLAPIMA (Capdevila's Plot)				Total	CAPAYÁN (Cacciato's Plot)				Total
	JT, TML		CBDT, FA-2			JT, TML		CBDT, FA-2		
	F	M	F	M		F	M	F	M	
03/31/95	0	1	0	0	1	0	3	0	0	3
04/04/95	0	3	0	0	3	0	4	0	0	4
04/07/95	0	3	1	0	4	0	7	1	0	8
04/11/95	0	5	0	0	5	0	4	0	0	4
04/14/95	0	0	2	0	2	0	0	0	0	0
04/18/95	0	7	0	1	8	0	3	0	0	3
04/21/95	0	1	1	0	2	0	0	0	0	0
04/25/95	0	1	0	0	1	0	1	0	0	1
04/28/95	1	1	0	1	3	0	1	1	0	2
05/02/95	0	5	0	0	5	0	2	0	0	2
05/05/95	0	0	1	0	1	0	1	0	0	1
05/09/95	0	2	0	1	3	0	1	0	0	1
05/12/95	0	1	0	0	1	0	0	1	0	1
05/16/95	0	1	1	0	2	0	2	0	0	2
05/19/95	0	2	0	0	2	0	1	0	0	1
05/23/95	0	0	0	0	0	0	1	0	0	1
05/26/95	0	0	0	0	0	0	0	0	0	0
05/30/95	0	1	0	0	1	0	3	2	0	5
06/02/95	0	3	0	0	3	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>37</b>	<b>6</b>	<b>3</b>	<b>47</b>	<b>0</b>	<b>34</b>	<b>5</b>	<b>0</b>	<b>39</b>
<b>F/T/D</b>	<b>0.003</b>	<b>0.112</b>	<b>0.018</b>	<b>0.009</b>	<b>0.142</b>	<b>0.000</b>	<b>0.103</b>	<b>0.015</b>	<b>0.000</b>	<b>0.118</b>

TABLE II. *C. capitata* CAPTURED (IN F/T/D) AT HUILLAPIMA AND CAPAYÁN (330 TRAP DAYS) (03/28/95 - 06/02/95)

Date	HUILLAPIMA (Capdevila's Plot)				CAPAYÁN (Cacciato's Plot)			
	JT, TML		CBDT, FA-2		JT, TML		CBDT, FA-2	
	F	M	F	M	F	M	F	M
03/31/95	0	0.07	0.00	0.00	0.00	0.20	0.00	0.00
04/04/95	0	0.15	0.00	0.00	0.00	0.20	0.00	0.00
04/07/95	0	0.20	0.07	0.00	0.00	0.47	0.07	0.00
04/11/95	0	0.25	0.00	0.00	0.00	0.20	0.00	0.00
04/14/95	0	0.00	0.13	0.00	0.00	0.00	0.00	0.00
04/18/95	0	0.35	0.00	0.05	0.00	0.15	0.00	0.00
04/21/95	0	0.07	0.07	0.00	0.00	0.00	0.00	0.00
04/25/95	0	0.05	0.00	0.00	0.00	0.05	0.00	0.00
04/28/95	0.07	0.07	0.00	0.07	0.00	0.07	0.07	0.00
05/02/95	0	0.25	0.00	0.00	0.00	0.10	0.00	0.00
05/05/95	0	0.00	0.07	0.00	0.00	0.07	0.00	0.00
05/09/95	0	0.10	0.00	0.05	0.00	0.05	0.00	0.00
05/12/95	0	0.07	0.00	0.00	0.00	0.00	0.07	0.00
05/16/95	0	0.05	0.05	0.00	0.00	0.10	0.00	0.00
05/19/95	0	0.13	0.00	0.00	0.00	0.07	0.00	0.00
05/23/95	0	0.00	0.00	0.00	0.00	0.05	0.00	0.00
05/26/95	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
05/30/95	0	0.05	0.00	0.00	0.00	0.15	0.10	0.00
06/02/95	0	0.20	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total</b>	<b>0.003</b>	<b>0.112</b>	<b>0.018</b>	<b>0.009</b>	<b>0.000</b>	<b>0.103</b>	<b>0.015</b>	<b>0.000</b>

In spite of the low number of medflies captured (86 in all), the CBDT, FA-2 had a high level of selectivity for the capture of females, mainly at Capayán where 100.0 % were females (5 females and 0 males). At Huillapima, however, only 66.6 % were females (6 females and 3 males).

The CBDT, FA-2 captured fewer non-target insects than JT, TML and this selectivity made it easier to handle.

The highest number of non-target insects were captured at Capayán due to the different ways of farm management. At Huillapima, plants suffered lack of irrigation. This did not happen at Capayán, but there were lots of weeds, mainly *Sorghum halepense*, which, added to the high humidity level, increased the population of non-target insects. Nevertheless, this did not become a problem in trap handling.

During the trial, with the CBDT, FA-2, there were no problems with the wind (which sometimes blew hard), predators or ants. Some moisture accumulated at the base of the CBDT, FA-2, although rainfall during the period of study was only 16.5 mm. In general, there were no management problems with the CBDT, FA-2.

There was no way to reach a conclusion (in the first stage) about the efficiency of the CBDT, FA-2 in capturing females because it was not compared to other traps (e.g. McPhail which capture insects of the same sex), the low population density of medfly, and because of the short period of study.

## 4. SECOND STAGE: 1995 - 1996

### 4.1. Materials and methods

The trial took place on two farms. One was located in Fray Mamerto Esquiú (Pomancillo Oeste). The experiment coincided with the beginning of the rainfall period in Catamarca and an increase in the number of medflies. The other site was a plot that belongs to the National University of Catamarca in Capayán (Colonia del Valle). This trial coincided with the period of low rainfall and a decrease in the population density of medflies.

At Site 1, Fray Mamerto Esquiú - Pomancillo Oeste, the crop was peach (*Prunus persica* L.), variety San Pedro 16 - 23. Trees were 7 yr old. The area of plantation was 3.5 ha at an altitude of 660 m. Experiments were conducted from September 12 to November 17, 1995. To the south of the peach trees, 10 m away, was a 6 ha plantation of quince trees (*Cydonia oblonga* Mill.), but their fruits were not likely to be attacked during the trial period. To the west, 11 m away, were 11 fig trees (*Ficus carica* L.) and 30 m away, was a small plantation of mandarin (85 plants) in five lines (17 plants per line); varieties Común (Common) or Criolla (Native), Satsuma and Murcot. Both the fig trees and the mandarin collection were not in production, so they had no fruits to be attacked.

At Site 2, Capayán - Colonia del Valle (University plot), the crop was mandarin (*C. deliciosa*), variety Común (Common) or Criolla (Native). Trees were 13 yr old. The area of plantation was 4 ha at an altitude of 430 m. Experiments were carried out from March 29 to June 7, 1996. This plot had other fruit trees such as orange - 1 ha; peach - 2 ha; apricot (*Prunus armeniaca* L.) without grafting (used as windbreak), and 10 plants of olive (*Olea europea* L.). There were other crops such as alfalfa (*Medicago sativa* L.), other forage crops and windbreaks with forestry which were not likely to be attacked by medflies. The peach, apricot and olive trees did not have fruits to be attacked when the trial was conducted. The peach plantation selected for the trial was not representative of the region because it had not received agrochemical treatments (fertilizer and pesticides). It is an organic plantation.

No phytosanitary treatment was applied during the trial on the mandarin and oranges trees. During this period, mineral oil was the only treatment applied to control scale insects (Homoptera: Diaspididae). On peach trees, medflies are controlled by toxic baits (in October), but these were not present during the trial. No treatment is applied on apricot (windbreak) which is an important hosts for medflies.

The following traps were used in a comparative way to capture *C. capitata* and other tephritidae: JT, TML; CBDT, FA-2; Open Bottom Dry Trap - an opaque green cylindrical open-bottom trap with yellow sticky insert, and baited with FA-2 (OBDT, FA-2); International Pheromone's McPhail Trap baited with 300 ml of an aqueous solution of 9 % NuLure and 3 % borax (IPMT, NU + B); Steiner Trap baited with FA-2 and containing a toxicant square (ST, FA-2).

Statistical design consisted of five lines (A to E) with five traps each: JT, TML; IPMT, NU + B; CBDT, FA-2; OBDT, FA-2 and ST, FA-2 placed at random. These traps were inspected twice a week and, after each check, were rotated sequentially.

At Fray Mamerto Esquiú, the rows of peach trees were 36 m apart, and the traps were 25 m apart in the rows. At Capayán, the distance between mandarin rows was 35 m, and between traps 28 m.

### 4.2. Results

#### Site 1: Fray Mamerto Esquiú

The data from *C. capitata* capture in the first trial are shown in Tables III and IV.

TABLE III. *C. capitata* CAPTURED (TOTALS AND F/T/D) AT POMANCILLO OESTE IN PEACH WITH EACH TYPE OF TRAP (330 TRAP DAY)(09/12/95 - 11/17/95)

Date	JT, TML		F/T/D	CBDT, FA-2		F/T/D	OBDT, FA-2		F/T/D	ST, FA-2		F/T/D	IPMT, NU+ B		F/T/D
	F	M		F	M		F	M		F	M		F	M	
09/15/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
09/19/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	2	0	0.10
09/22/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
09/26/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
09/29/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
10/03/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	1	0.05
10/06/95	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.07	3	0	0.20
10/10/95	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.05	2	0	0.10
10/13/95	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.07	5	2	0.47
10/17/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	4	0	0.20
10/20/95	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	8	1	0.60
10/24/95	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.05	50	2	2.60
10/27/95	0	6	0.40	0	0	0.00	0	0	0.00	6	0	0.40	69	2	4.73
10/31/95	0	6	0.30	0	0	0.00	5	0	0.25	4	0	0.20	61	2	3.15
11/03/95	0	34	2.27	2	0	0.13	15	0	1.00	4	0	0.27	261	21	18.80
11/07/95	0	118	5.90	12	1	0.65	2	0	0.10	1	1	0.10	377	32	20.45
11/10/95	0	172	11.47	8	5	0.87	29	1	2.00	2	0	0.13	480	68	36.53
11/14/95	4	325	16.45	36	2	1.90	37	0	1.85	9	1	0.50	522	55	28.85
11/17/95	0	262	17.47	5	1	0.40	17	1	1.20	0	0	0.00	944	99	69.53
<b>Total</b>	<b>4</b>	<b>923</b>		<b>63</b>	<b>9</b>		<b>105</b>	<b>2</b>		<b>30</b>	<b>2</b>		<b>2788</b>	<b>285</b>	
<b>F/T/D</b>	<b>0.012</b>	<b>2.797</b>	<b>2.809</b>	<b>0.191</b>	<b>0.027</b>	<b>0.218</b>	<b>0.318</b>	<b>0.006</b>	<b>0.324</b>	<b>0.091</b>	<b>0.006</b>	<b>0.097</b>	<b>8.448</b>	<b>0.864</b>	<b>9.312</b>

TABLE IV. *C. capitata* CAPTURED (IN F/T/D) AT POMANCILLOESTE IN PEACH (330 TRAP DAYS) (09/12/95 - 11/17/95)

Date	JT, TML		CBDT, FA-2		OBDT, FA-2		ST, FA-2		IPMT, NU+B	
	F	M	F	M	F	M	F	M	F	M
34956	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34960	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00
34963	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34967	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
09/29/95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/03/95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
10/06/95	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.20	0.00
10/10/95	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.10	0.00
10/13/95	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.33	0.13
10/17/95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
10/20/95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.07
10/24/95	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	2.50	0.10
10/27/95	0.00	0.40	0.00	0.00	0.00	0.00	0.40	0.00	4.60	0.13
10/31/95	0.00	0.30	0.00	0.00	0.25	0.00	0.20	0.00	3.05	0.10
11/03/95	0.00	2.27	0.13	0.00	1.00	0.00	0.27	0.00	17.40	1.40
11/07/95	0.00	5.90	0.60	0.05	0.10	0.00	0.05	0.05	18.85	1.60
11/10/95	0.00	11.47	0.53	0.33	1.93	0.07	0.13	0.00	32.00	4.53
11/14/95	0.20	16.25	1.80	0.10	1.85	0.00	0.45	0.05	26.10	2.75
11/17/95	0.00	17.47	0.33	0.07	1.13	0.07	0.00	0.00	62.93	6.60
<b>Total</b>	<b>0.012</b>	<b>2.797</b>	<b>0.191</b>	<b>0.027</b>	<b>0.318</b>	<b>0.006</b>	<b>0.091</b>	<b>0.006</b>	<b>8.448</b>	<b>0.864</b>

Infestation percentage was determined taking ten fruits at random from ten plants at the beginning of each week. In all cases the result was zero.

The pH of NuLure when just prepared, varied between 8.5 and 8.6; whereas the pH of NuLure recycled weekly varied between 8.3 and 8.5.

Staining of medfly females spermathecae, both in peach and mandarin trials, showed the following unmated females percentages: IPMT, NU+ B - 7.0 %; CBDT, FA-2 - 27.27 %; OBDT, FA-2 - 13.63 %; ST, FA-2 - 21.73 %; JT, TML - 0.0 %.

In the peach trial, 15 larvae/kg of fruit were obtained. In the fruit sample taken in the same place in 1994, 88 larvae/kg of fruit were caught. In all cases the only species obtained was *C. capitata*.

#### Site 2: Capayán, Colonia del Valle (University plot)

The data from *C. capitata* capture in the second trial are shown in Tables V and VI.

As in the first trial, infestation percentage was determined taking ten fruits at random from ten plants at the beginning of each week. In all cases the result was zero.

The pH of NuLure, when just prepared, varied between 8.8 and 8.9; whereas the pH of NuLure recycled weekly varied between 8.5 and 8.8.

Fruit sampling showed the following results: Mandarin - 1 larva/kg of fruit; Orange - 5 larvae/kg of fruit. The only species obtained was *C. capitata*, the same as in Trial 1.



TABLE V. *C. capitata* CAPTURED (TOTALS AND F/T/D) AT CAPAYÁN, COLONIA DEL VALLE (UNIVERSITY PLOT) IN MANDARIN (350 TRAP DAYS) (03/29/96 - 06/07/96)

Date	JT, TML		F/T/D	CBDT, FA-2		F/T/D	OBDT, FA-2		F/T/D	ST, FA-2		F/T/D	IPMT, NU + B		F/T/D
	F	M		F	M		F	M		F	M		F	M	
04/02/96	0	9	0.60	0	0	0.00	0	0	0.00	0	0	0.00	0	1	0.07
04/05/96	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
04/09/96	0	17	1.13	0	0	0.00	1	0	0.07	0	0	0.00	1	0	0.07
04/12/96	0	7	0.35	0	0	0.00	0	1	0.05	0	0	0.00	1	1	0.10
04/16/96	0	6	0.40	1	0	0.07	0	0	0.00	1	0	0.07	0	0	0.00
04/19/96	0	4	0.20	0	0	0.00	0	0	0.00	0	0	0.00	2	0	0.10
04/23/96	0	3	0.20	0	0	0.00	0	0	0.00	0	0	0.00	2	1	0.20
04/26/96	0	4	0.20	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00
04/30/96	0	11	0.73	0	0	0.00	0	0	0.00	1	0	0.07	1	0	0.07
05/03/96	0	4	0.20	0	0	0.00	0	0	0.00	0	0	0.00	4	0	0.20
05/07/96	0	15	1.00	0	0	0.00	0	0	0.00	0	0	0.00	1	0	0.07
05/10/96	0	4	0.20	0	0	0.00	0	0	0.00	0	0	0.00	2	0	0.10
05/14/96	0	18	1.20	0	0	0.00	0	0	0.00	1	0	0.07	1	0	0.07
05/17/96	0	25	1.25	0	0	0.00	0	0	0.00	0	0	0.00	1	1	0.10
05/21/96	0	25	1.67	0	0	0.00	0	0	0.00	2	0	0.13	6	3	0.60
05/24/96	0	11	0.55	1	1	0.10	0	0	0.00	1	0	0.05	7	2	0.45
05/28/96	0	86	5.73	0	0	0.00	0	0	0.00	2	0	0.13	13	5	1.20
06/01/96	0	44	2.20	0	0	0.00	0	0	0.00	1	0	0.05	6	2	0.40
06/04/96	0	27	1.80	0	1	0.07	0	0	0.00	1	1	0.13	0	0	0.00
06/07/96	0	46	3.07	0	0	0.00	0	0	0.00	1	0	0.07	3	0	0.20
<b>Total</b>	<b>0</b>	<b>366</b>		<b>2</b>	<b>2</b>		<b>1</b>	<b>1</b>		<b>11</b>	<b>1</b>		<b>51</b>	<b>16</b>	
<b>F/T/D</b>	<b>0.000</b>	<b>1.046</b>	<b>1.046</b>	<b>0.006</b>	<b>0.006</b>	<b>0.012</b>	<b>0.003</b>	<b>0.003</b>	<b>0.006</b>	<b>0.031</b>	<b>0.003</b>	<b>0.034</b>	<b>0.146</b>	<b>0.045</b>	<b>0.191</b>

TABLE VI. *C. capitata* CAPTURED (IN F/T/D) AT CAPAYÁN (UNIVERSITY PLOT) IN MANDARIN (350 TRAP DAYS) (03/29/96 - 06/ 07/96)

Date	JT, TML		CBDT, FA-2		OBDT, FA-2		ST, FA-2		IPMT, NU+B	
	F	M	F	M	F	M	F	M	F	M
04/02/96	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
04/05/96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/09/96	0.00	0.85	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.00
04/12/96	0.00	0.47	0.00	0.00	0.00	0.07	0.00	0.00	0.07	0.07
04/16/96	0.00	0.30	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00
04/19/96	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00
04/23/96	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.05
04/26/96	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/30/96	0.00	0.55	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00
05/03/96	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00
05/07/96	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
05/10/96	0.00	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00
05/14/96	0.00	0.90	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00
05/17/96	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
05/21/96	0.00	1.25	0.00	0.00	0.00	0.00	0.10	0.00	0.30	0.15
05/24/96	0.00	0.73	0.07	0.07	0.00	0.00	0.07	0.00	0.47	0.13
05/28/96	0.00	4.30	0.00	0.00	0.00	0.00	0.10	0.00	0.65	0.25
06/01/96	0.00	2.20	0.00	0.00	0.00	0.00	0.05	0.00	0.30	0.10
06/04/96	0.00	1.80	0.00	0.07	0.00	0.00	0.07	0.07	0.00	0.00
06/07/96	0.00	3.07	0.00	0.00	0.00	0.00	0.07	0.00	0.20	0.00
<b>Total</b>	<b>0.00</b>	<b>1.046</b>	<b>0.006</b>	<b>0.006</b>	<b>0.003</b>	<b>0.003</b>	<b>0.031</b>	<b>0.003</b>	<b>0.146</b>	<b>0.045</b>

#### 4.3. Discussion and conclusions

In Trial 1, three species of Tephritidae were captured: *C. capitata*, *A. fraterculus* and *A. daciformis*, the last one being the first record in Catamarca. In Trial 2, *C. capitata* and *A. fraterculus* were captured. In all cases, the predominant species was *C. capitata*.

In Trial 1, the trap that captured the largest number of *C. capitata* was the IPMT, NU + B with 72.97 % of all the medflies captured, followed by the JT, TML with 22.01 %, OBDT, FA-2 with 2.54%, CBDT, FA-2 with 1.71%, and ST, FA-2 with 0.76%.

In Trial 2, the trap with the largest number of medflies captured was the JT, TML with 81.15 %, followed by the IPMT, NU + B with 14.85 %, ST, FA-2 with 2.67%, CBDT, FA-2 with 0.89%, and OBDT, FA-2 with 0.44%. The lower percentage of captures in IPMT, NU+B in Trial 2 may be due to temperature effects. Trial 1 was carried out in spring with high ever-increasing temperature, while Trial 2 took place in fall, with lower decreasing temperatures. The lower the temperature, the less evaporation of the attractant, therefore, the fewer number of insects captured.

Taking into consideration the total number of females captured, the trap that captured the greatest number of females was the IPMT, NU+B. During Trial 1, it captured 93.25 %, OBDT, FA-2 captured 3.51 %, CBDT, FA-2 captured 2.11 %, ST, FA-2 captured 1.0 %, and JT, TML captured 0.13 %. In Trial 2, IPMT, NU+ B captured 78.46 %, ST, FA-2 captured

16.92 % OBDT, FA-2 captured 1.54 %, CBDT, FA-2 captured 3.07 %, and JT, TML captured 0.0 %.

In JT, TML, 99 - 100 % of the flies were male. This was an expected result because TML is a specific attractant for *C. capitata* males. JTs captured 4 females on the same day and in the previous to the last revision date (Table III).

In Trial 1, the dry trap that captured the largest number of medflies was OBDT, FA-2 with 2.54 % of the total amount captured (98.13 % females and 1.86 % males), followed by CBDT, FA-2 with 1.71 % (87.5 % females and 12.5 % males). Both traps began capturing *C. capitata* towards the end of the trial, when the medfly population increased. ST, FA-2 captured 0.76 % (93.75 % females and 6.25 % males), although it started capturing medflies at low population densities (Tables III).

In Trial 2, the most efficient dry trap was ST, FA-2 with 2.67 % (91.66 % females and 8.33 % males), whereas CBDT, FA-2 captured 0.89 % (50 % females and 50 % males), and OBDT, FA-2 captured 0.44 % (50 % females and 50 % males).

In Trial 1, the trap with the most Relative Trap Efficiency (RTE) for females of *C. capitata* was IPMT, NU+B with 93.25 %, followed by OBDT, FA-2 with 3.51 %, CBDT, FA-2 with 2.11%, ST, FA-2 with 1.00% and JT, TML with 0.13%. In Trial 2, the RTE was again best in IPMT, NU+B with 78.46 %, followed by ST, FA-2 with 16.92 %, CBDT, FA-2 with 3.08%, OBDT, FA-2 with 1.54%, and JT, TML with 0%.

In Trial 1, 22 *A. fraterculus* were captured, 20 (13 female, 7 male) with IPMT, NU+B, and 1 male with CBDT, FA-2 and 1 female with ST, FA-2. A total of 141 *A. daciformis* were also captured: 36 females and 101 females with IPMT, NU+B; 1 male with CBDT, FA-2; 1 male and 1 female with OBDT, FA-2; and 1 female with ST, FA-2.

In Trial 2, 26 *A. fraterculus* were captured, 23 (11 female, 12 male) with IPMT, NU+B, 2 male with CBDT, FA-2 and 1 female with ST, FA-2.

The trap that captured the greatest number of non-target insects was IPMT, NU+ B. Most were diptera - Muscidae or Lonchaeidae (especially *Carpolonchaea (Lonchaea) pendula* Bezzi). Some authors consider *C. pendula* part of the fruit fly complex. The most diptera captured were 214 and this was in Trial 1. Although fewer in number, some hymenoptera were also captured - mainly *Polistes canadensis* (L.), a vespid.

In the peach trial, the greatest number of medflies and other insects were captured in the last lines, mainly D and E. This might have been because these trees had not been pruned, and they gave more protection to the insects (data not shown).

In the second trial, the number of non-target insects decreased in all traps due to lower temperatures except for *Euxesta* spp. (Diptera: Ulidiidae) which was captured by the end of the trial (April 6). In the CBDT, FA-2 there were 81, in ST, FA-2 there were 13, and in the OBDT, FA-2 there were none.

The number of *Euxesta* spp. captured by the OBDT, FA-2 was 4. Because of this and the low number of non-target insects captured by this trap, we think that the insects escape because they do not get stuck in the yellow sticky inserts, except when insect populations are large.

JT, TML and dry traps captured fewer non-target insects and were easier to handle in the field. The IPMT, NU+B, on the other hand, was more difficult to handle because it contained a liquid bait.

In Trial I, dry traps showed a high selectivity in the capture of *C. capitata* females. In the second trial, ST, FA-2 maintained this characteristic, whereas in CBDT, FA-2 and OBDT, FA-2 fewer insects were captures and the ratio of males: females was 1:1, although, from the limited number of medflies captured (4 in CBDT, FA-2 and 2 in OBDT, FA-2), no conclusions could be drawn.

There were no problems with predators or ants in the dry traps, but moisture accumulated at the base of CDBT, FA-2 and ST, FA-2 on some days.

During Trial 1, the only trap that had problems because of wind was ST, FA-2 which fell to the ground three times. This difficulty can be easily resolved by changing the hook of the trap.

In general, it can be said that there were no problems with handling the dry traps.

In Trial 1, harvest began on October 17, 1995 with a very low medfly population, mostly males. Due to the fact that this peach variety ripened early and there was a short period of harvest, fruit damage was minor and the twenty five traps deployed in this small orchard could have acted as a control method. In this trial, the maximum F/T/D was 69.53 for IPMT, NU+B, and 17.47 for JT, TML, both in the last revision (Tables III and IV). The maximum index was 1.90 for CDBT, FA-2; 2.00 for OBDT, FA-2; and 0.5 for ST, FA-2 (Tables III and IV). All flies were captured towards the end of the trial when there were very few fruits on the trees.

In Trial 2, harvest began on May 7, 1996 with a low medfly population, mostly females, although there was a larger number of flies than in the previous test by the time of harvest (Tables V and VI). In this trial the total number of medflies was lower, even though population density was more stable through the period. In this case, 25 traps may have also acted as a control method. The maximum F/T/D was 5.73 for JT, TML and 1.20 for IPMT, NU+B, both obtained on the same date (May 28, 1996) near the end of the trial. The maximum index obtained for CDBT, FA-2 was 0.10; for OBDT, FA-2 was 0.07; and for ST, FA-2 was 0.13.

In both trials, medfly populations increased by the end of the period. This coincides with fruit ripening, although fruits were scarce because of the short period of harvesting, mostly in the peach orchard (November 3 - 17 for peach, May 21 to June 6 for mandarin).

## 5. THIRD STAGE - 1997

### 5.1. Materials and methods

The trial in the Third Stage was carried out at Huillapima (Capayán) at Mr. Capdevila's farm, the same place where a similar trial was performed in 1995 (First Stage). This farm was chosen because no insecticides are used. Although the medfly population density is low, in the rest of the fruit trees, especially in the last years, chemical treatments are applied against this pest.

The beginning of the experiment coincided with the period of low rainfall in Catamarca and the decrease in the population density of medfly. The observation site was the same as previously described except the plants were two years older. Tests were conducted between April 11 and June 20, 1997.

The following traps were used in a comparative way to capture *C. capitata* and other tephritidae: JT, TML; Tephri trap, baited with TML and water; IPMT, NU + B, baited with 300 ml of an aqueous solution of 9 % NuLure + 3 % borax; FRUTECT trap (Frutect) with one red spherical container with special formulation liquid lure and a yellow sticky display board with hanging cord; OBDT, FA-2 attractants with yellow sticky insert; OBDT, baited with FA-3 attractants - ammonium acetate, putrescine and trimethylamine, and with yellow sticky insert (OBDT, FA-3); ST, FA-2 with an insecticide (piretroid) in the base of the trap to kill insects (ST, FA-2); ST, FA-3 attractants with an insecticide in the base.

Statistical design consisted of five lines (A to E) with eight traps each (JT, TML; Tephri, TML; IPMT, NU+ B; Frutect; OBDT, FA-2; OBDT, FA-3; ST, FA-2; and ST, FA-3 placed at random. The rows of mandarin trees were 35 m apart, and the traps were 28 m apart in the rows.

TABLE VII. C. capitata CAPTURED (TOTALS AND F/T/D) AT HUILLAPIMA IN MANDARIN (355 TRAP DAYS) (04/11/97 - 06/20/97)

Date	JT, TML			F/T/D			TEPHRI, TML			F/T/D			IPMT, NU + B			F/T/D			FRUTECT			F/T/D
	F	M	T	F	M	T	F	M	T	F	M	T	F	M	T	F	M	T	F	M	T	
04/15/97	0	2	2	0	1	1	0	1	1	0.1	0.05	3	0	0	3	0	0	0	0	0	0	0
04/18/97	0	0	0	0	0	0	0	0	0	0.00	0.00	3	0	0	3	0	0	0	0	0	0	0
04/22/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
04/25/97	0	0	0	0	0	0	0	0	0	0.00	0.00	2	1	3	0	0	0	0	0	0	0	0
04/29/97	0	0	0	0	0	0	0	0	0	0.00	0.00	1	0	1	0	0	0	0	0	0	0	0
05/02/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
05/06/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
05/09/97	0	0	0	0	0	0	0	0	0	0.00	0.00	3	0	3	0	0	0	0	0	0	0	0
05/13/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
05/16/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
05/20/97	0	0	0	0	0	0	0	0	0	0.00	0.00	1	0	1	0	0	0	0	0	0	0	0
05/23/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
05/27/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
05/30/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
06/03/97	0	0	0	0	0	0	0	0	0	0.00	0.00	1	0	1	0	0	0	0	0	0	0	0
06/06/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
06/10/97	0	0	0	0	1	1	0	1	1	0.00	0.05	1	0	1	0	0	0	0	0	0	0	0
06/13/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
06/17/97	0	1	1	0	0	0	0	0	0	0.05	0.00	0	0	0	0	0	0	0	0	0	0	0
06/20/97	0	0	0	0	0	0	0	0	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>2</b>			<b>15</b>	<b>1</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>F/T/D</b>	<b>0.000</b>	<b>0.008</b>	<b>0.008</b>	<b>0.000</b>	<b>0.006</b>	<b>0.006</b>	<b>0.000</b>	<b>0.006</b>	<b>0.006</b>			<b>0.042</b>	<b>0.003</b>	<b>0.045</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>

TABLE VII. ( CONTINUATION)

Date	OBDT, FA- 2			F/T/D	OBDT, FA- 3			F/T/D	ST, FA-2			F/T/D	ST, FA- 3			F/T/D
	F	M	T		F	M	T		F	M	T		F	M	T	
04/15/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
04/18/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
04/22/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
04/25/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
04/29/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/02/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/06/97	0	0	0	0.00	0	0	0	0.00	1	0	1	0.05	0	0	0	0.00
05/09/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/13/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/16/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/20/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/23/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/27/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
05/30/97	0	0	0	0.00	1	0	1	0.07	0	0	0	0.00	0	0	0	0.00
06/03/97	0	0	0	0.00	0	0	0	0.00	1	0	1	0.05	0	0	0	0.00
06/06/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
06/10/97	0	0	0	0.00	1	0	1	0.05	0	0	0	0.00	0	0	0	0.00
06/13/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	1	0	1	0.07
06/17/97	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
35600	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>		<b>2</b>	<b>0</b>	<b>2</b>		<b>2</b>	<b>0</b>	<b>2</b>		<b>1</b>	<b>0</b>	<b>0</b>	
<b>F/T/D</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>		<b>0.006</b>	<b>0.000</b>	<b>0.006</b>		<b>0.006</b>	<b>0.000</b>	<b>0.006</b>		<b>0.003</b>	<b>0.000</b>	<b>0.003</b>	

TABLE VIII. *C. capitata* CAPTURED (IN F/T/D) ATHUILLAPIMA IN MANDARIN (355 TRAP DAYS) (04/11/97 - 06/20/97)

Date	JT, TML		TEPHRI, TML		IPMT, NU + B		FRUTECT		OBDT, FA-2		OBDT, FA-3		ST, FA-2		ST, FA-3	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
04/15/97	0	0.10	0	0.05	0.15	0	0	0	0	0	0	0	0	0	0	0
04/18/97	0	0	0	0	0.20	0	0	0	0	0	0	0	0	0	0	0
04/22/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04/25/97	0	0	0	0	0.13	0.07	0	0	0	0	0	0	0	0	0	0
04/29/97	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0
05/02/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/06/97	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0
05/09/97	0	0	0	0	0.20	0	0	0	0	0	0	0	0	0	0	0
05/13/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/16/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/20/97	0	0	0	0	0.05	0	0	0	0	0	0	0	0	0	0	0
05/23/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/27/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05/30/97	0	0	0	0	0	0	0	0	0	0	0.07	0	0	0	0	0
06/03/97	0	0	0	0	0.05	0	0	0	0	0	0	0	0.05	0	0	0
06/06/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/10/97	0	0	0	0.05	0.05	0	0	0	0	0	0.05	0	0	0	0	0
06/13/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0
06/17/97	0	0.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06/20/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>F/T/D</b>	<b>0.000</b>	<b>0.008</b>	<b>0.000</b>	<b>0.006</b>	<b>0.042</b>	<b>0.003</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.006</b>	<b>0.000</b>	<b>0.006</b>	<b>0.000</b>	<b>0.003</b>	<b>0.000</b>

## 5.2. Results

Tables VII and VIII summarize the total capture of *C. capitata* for each type of trap, revision date, number of flies, F/T/D, and male - female relationship.

Infestation percentage was determined taking ten fruits at random from ten plants at the beginning of each week. In all cases, the result was zero (mandarin and grapefruit).

The pH of NuLure, just prepared, varied between 8.4 and 9.4, whereas the pH of NuLure recycled weekly varied between 8.2 and 9.3.

Staining of medfly female spermathecae showed the following unmated female percentage: IPMT, NU + B - 13.33 %; OBDT, FA-3 - 0.0 %; ST, FA-2 - 0.0 %; ST, FA-3 - 0.0 %.

The following traps did not capture any females: Frutect; JT, TML; Tephri, TML; and OBDT, FA-2. In this trial there were zero larva/ kg fruit.

## 5.3. Discussion and conclusions

Two species of tephritidae were obtained in this trial: *C. capitata* and *A. fraterculus*. The predominant species was *C. capitata*.

The trap that caught the largest number of *C. capitata* was IPMT, NU+B with 61.54 % of the total followed by the JT, TML with 11.54 %. The Tephri, OBDT, FA-3, and ST, FA-2, captured 7.69%, while ST, FA-3 captured 3.85% and OBDT, FA-2, and Frutect captured 0%.

The trap with the most relative efficiency to capture *C. capitata* females was IPMT, NU + B with 75.00 %, followed by OBDT, FA-3 and ST, FA-2 each with 10.00 % and the ST, FA-3 with 5.00 %. The following traps did not capture any females: JT, TML; Frutect; OBDT, FA-2; and Tephri, TML. The Frutect and OBDT, FA-2 did not capture any medflies.

The largest number of F/T/D obtained was 0.20 for IPMT, NU + B (Tables VII and VIII), which indicated that the medfly population density was low.

The Frutect trap had the most handling disadvantages, and dust and small plant residues also stuck to it. The sticky spray apparently had little adhesive power because it captured only a few, small insects. No medflies were captured by this trap.

In general, the capture of non - target insects was low in all traps.

In the trial, eleven *A. fraterculus* (6 females and 5 males) were captured: 9 in the IPMT, NU+B; an one each in OBDT, FA-3 and ST, FA-3. The most efficient was IPMT, NU + B with 81.82 % of the total.

It is important to point out that because of the low population density of medflies, it is difficult to arrive at a conclusion about the efficiency of the traps used in the trial.

## 6. FOURTH STAGE - 1997

### 6.1. Materials and methods

The trial in the Stage IV was carried out in Pomancillo Oeste (Fray Mamerto Esquiú) in the same peach plantation as in the Stage II (1995). No agrochemicals are used here. The experiment coincided with the beginning of the rainfall period in Catamarca and an increase in the number of medflies. The observation site has been previously described except the trees were two years older.

The mandarin and fig trees were in full production in 1997 (but not in 1995). However, the mandarin trees did not have fruits when the trial was conducted, and the figs were unlikely to be attacked by fruit flies because they were too small and immature.

The following traps were used in a comparative way to capture *C. capitata* and other tephritids: JT, TML; IPMT as a wet trap, baited with FA-3, with 300 ml of water for retention



and 1 - 2 drops of surfactant (IPMT, FA-3, water); IPMT as a dry trap, baited with FA-3 and DDVP in base for retention (IPMT, FA-3, DDVP); Tephri Trap as a dry trap, baited with FA-3 and DDVP in basket for retention (Tephri, FA-3, DDVP); Steiner Trap, baited with FA-3 and DDVP in base for retention (ST, FA-3, DDVP); IPMT baited with 300 ml of aqueous NU+B (IPMT, NU+ B).

Statistical design consisted of five lines (A to E) with six traps each placed at random (JT, TML; Tephri, FA-3, DDVP; IPMT, FA-3, water; IPMT, FA-3, DDVP; IPMT, NU + B; and ST, FA-3, DDVP). The rows of peach trees were 36 m apart, and the traps were 25 m apart in the rows.

## 6.2. Results

Tables IX and X summarize the total capture of *C. capitata* for each type of trap, revision date, F/T/D, and male - female relationship. Table XI shows the number of males and females captured per trap and per period for the trial.

Infestation percentage was determined taking ten fruits at random from ten plants at the beginning of each week. In all cases the result was zero.

The pH of NuLure, when just prepared, varied between 6.8 and 7.7, whereas the pH of NuLure recycled weekly varied between 8.1 and 8.7.

Staining of medfly females spermathecae showed the following percentages of unmated females: IPMT, FA-3, water - 16.67 %; Tephri, FA-3, DDVP - 20.51 %; IPMT, FA-3, DDVP - 21.43 %; ST, FA-3, DDVP - 17.14 %; IPMT, NU+ B - 14.00 %; JT, TML - 0.00 %.

In the trial 25 adults /kg of fruit were obtained. The only species was *C. capitata*, and all from the variety "cuaresmillo".

## 6.3. Discussion and conclusions

*C. capitata* and *Anastrepha* spp. were captured during this trial.

In the trial, the trap that captured the largest number of *C. capitata* was IPMT, FA -3, DDVP with 30.44 % of all medflies captured, followed by the IPMT, FA-3, wet with 27.13 %, IPMT, NU+B with 14.43%, Tephri, FA-3, DDVP with 11.55%, JT, TML with 10.10% and ST, FA-3 with 6.35%. Taking into consideration the RTE for females of *C. capitata* captured, the most efficient trap was IPMT, FA-3, DDVP with 32.98 %, followed by IPMT, FA-3, water with 30.47 %, IPMT, NU+ B with 17.00 %, Tephri, FA-3, DDVP with 13.43 %, ST, FA-3, DDVP with 6.07 %, and JT, TML with 0.05 %.

The JT, TML captured 99 - 100 % males. This was an expected result because TML is a specific attractant for *C. capitata* males. JT, TML captured one female in 425 trap days (Table IX).

During the trial, the only non-target insect captured in great number was *Neomyennis* spp. (Diptera: Pterocallidae). All traps, except JT, TML with only two males, captured this species (975 in IPMT, NU+B; 408 in IPMT, FA-3, water; 1156 with IPMT, FA-3, DDVP, 1529 in Tephri, FA-3, DDVP, and 351 in ST, FA-3, DDVP).

The trap that captured the greatest number of non - target insects was IPMT, NU+B. Most were Diptera of the Muscidae and Lonchaeidae families. Within this last family *Carpolonchaea (Lonchaea) pendula* Bezzi was the predominant species captured. Some authors consider it as part of the fruit fly complex. Hymenoptera were also captured, mainly *Polistes canadensis* (L.), although in fewer in number than the *Neomyennis* spp.

TABLE IX. *C. capitata* CAPTURED (TOTALS AND F/T/D) AT POMANCILLOESTE IN PEACH(425 TRAP DAY) (09/12/97 - 12/05/97)

Date	JT, TML			IPMT, NU + B			IPMT, FA-3, Wet			IPMT, FA-3, DDVP			Tephri, FA-3, DDVP			ST, FA-3, DDVP		
	F	M	T	F	M	T	F	M	T	F	M	T	F	M	T	F	M	T
09/16/97	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
09/19/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09/23/97	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0
09/26/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09/30/97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/03/97	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0
10/07/97	0	0	0	1	0	1	0	0	0	1	0	1	-	-	-	0	0	0
10/10/97	0	0	0	3	0	3	1	0	1	2	0	2	0	0	0	0	0	0
10/14/97	0	0	0	6	0	6	7	0	7	4	0	4	7	0	7	0	0	0
10/17/97	0	0	0	7	0	7	4	0	4	2	0	2	2	0	2	1	0	1
10/21/97	0	0	0	22	0	22	19	0	19	10	0	10	4	0	4	6	0	6
10/24/97	0	1	1	33	2	35	86	0	86	29	0	29	6	0	6	3	0	3
10/28/97	1	1	2	65	1	66	69	2	71	34	2	36	75	0	75	17	0	17
10/31/97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35737	0	19	19	40	10	50	48	6	54	64	5	69	37	2	39	14	2	16
35740	0	9	9	7	1	8	49	8	57	18	6	24	71	13	84	15	2	17
35744	0	13	13	11	7	18	63	14	77	13	3	16	26	15	41	6	1	7
11/14/97	0	11	11	0	0	0	35	11	46	10	3	13	10	3	13	4	4	8
11/18/97	0	32	32	7	1	8	37	29	66	36	28	64	10	11	21	2	2	4
11/21/97	0	93	93	19	10	29	38	19	57	86	39	125	17	8	25	14	19	33
11/25/97	0	33	33	72	30	102	43	18	61	165	49	214	17	7	24	12	3	15
11/28/97	0	76	76	52	8	60	86	38	124	160	60	220	10	5	15	7	8	15
35765	0	21	21	15	4	19	63	28	91	65	20	85	0	0	0	28	23	51
35768	0	5	5	11	4	15	18	5	23	23	12	35	1	1	2	4	1	5
<b>Total</b>	<b>1</b>	<b>314</b>	<b>315</b>	<b>372</b>	<b>78</b>	<b>450</b>	<b>667</b>	<b>179</b>	<b>846</b>	<b>722</b>	<b>227</b>	<b>949</b>	<b>294</b>	<b>66</b>	<b>360</b>	<b>133</b>	<b>65</b>	<b>198</b>
<b>F/T/D</b>	<b>0.002</b>	<b>0.739</b>	<b>0.741</b>	<b>0.875</b>	<b>0.183</b>	<b>1.058</b>	<b>1.569</b>	<b>0.421</b>	<b>1.990</b>	<b>1.698</b>	<b>0.534</b>	<b>2.232</b>	<b>0.692</b>	<b>0.155</b>	<b>0.847</b>	<b>0.313</b>	<b>0.153</b>	<b>0.466</b>

TABLE X. *C. capitata* CAPTURED (IN F/T/D) AT POMANCILLO OESTE IN PEACH (425 TRAP DAYS) (09/12/97 - 12/05/97)

Date	JT, TML		IPMT, NU+B		IPMT, FA-3, Wet		IPMT, FA-3, DDVP		TEPHRI, FA-3, DDVP		ST, FA-3, DDVP	
	F	M	F	M	F	M	F	M	F	M	F	M
09/16/97	0	0	0.05	0	0	0	0	0	0	0	0	0
09/19/97	0	0	0	0	0	0	0	0	0	0	0	0
09/23/97	0	0	0	0	0.05	0	0	0	0	0.05	0	0
09/26/97	0	0	0	0	0	0	0	0	0	0	0	0
09/30/97	0	0	0	0	0	0	0	0	0	0	0	0
10/03/97	0	0	0	0	0	0.07	0	0	0.07	0	0	0
10/07/97	0	0	0.05	0	0	0	0.05	0	-	-	0	0
10/10/97	0	0	0.20	0	0.07	0	0.13	0	0	0	0	0
10/14/97	0	0	0.30	0	0.35	0	0.20	0	0.35	0	0	0
10/17/97	0	0	0.47	0	0.27	0	0.13	0	0.13	0	0.07	0
10/21/97	0	0	1.10	0	0.95	0	0.50	0	0.20	0	0.30	0
10/24/97	0	0.07	2.20	0.13	5.73	0	1.93	0	0.40	0	0.20	0
10/28/97	0.05	0.05	3.25	0.05	3.45	0.10	1.70	0.10	3.75	0	0.85	0
10/31/97	-	-	-	-	-	-	-	-	-	-	-	-
11/04/97	0	0.54	1.14	0.28	1.37	0.17	1.83	0.14	1.06	0.06	0.40	0.06
11/07/97	0	0.60	0.47	0.07	3.27	0.53	1.20	0.40	4.73	0.87	1.00	0.13
11/11/97	0	0.65	0.55	0.35	3.15	0.70	0.65	0.15	1.30	0.75	0.30	0.05
11/14/97	0	0.73	0	0	2.33	0.73	0.67	0.20	0.67	0.20	0.27	0.27
11/18/97	0	1.60	0.35	0.05	1.85	1.45	1.80	1.40	0.50	0.55	0.10	0.10
11/21/97	0	6.20	1.27	0.67	2.53	1.27	5.73	2.60	1.13	0.53	0.93	1.27
11/25/97	0	1.65	3.60	1.50	2.15	0.90	8.25	2.45	0.85	0.35	0.60	0.15
11/28/97	0	5.07	3.47	0.53	5.73	2.53	10.67	4.00	0.67	0.33	0.47	0.53
12/02/97	0	1.05	0.75	0.20	3.15	1.87	3.25	1.00	0	0	1.40	1.15
12/05/97	0	0.33	0.73	0.27	1.20	0.33	1.53	0.80	0.07	0.07	0.27	0.07
<b>F/T/D</b>	<b>2</b>	<b>0.739</b>	<b>0.875</b>	<b>0.183</b>	<b>1.569</b>	<b>0.421</b>	<b>1.698</b>	<b>0.534</b>	<b>0.692</b>	<b>0.155</b>	<b>0.313</b>	<b>0.153</b>

TABLE XI. TOTAL NUMBER OF MALES AND FEMALES OF *C. capitata* CAPTURED DURING THE TRIAL PER TRAP AND PER PERIOD IN POMANCILLO OESTE, DEPARTAMENTO FRAY MAMERTO ESQUIÚ. 1997

Period	JT, TML		IPMT, NU + B		IPMT, FA-3, WET		IPMT, FA-3, DDVP		TEPHRI, FA-3, DDVP		ST, FA-3, DDVP	
	F	M	F	M	F	M	F	M	F	M	F	M
<b>I</b>	0	0	1	0	1	0	0	0	0	1	0	0
<b>II</b>	0	0	10	0	8	1	7	0	8	0	0	0
<b>III</b>	1	2	127	3	178	2	75	2	87	0	27	0
<b>IV</b>	0	84	65	19	232	68	141	45	154	44	41	11
<b>V</b>	0	228	169	56	248	108	499	180	45	21	65	54
<b>Total</b>	<b>1</b>	<b>314</b>	<b>372</b>	<b>78</b>	<b>667</b>	<b>179</b>	<b>722</b>	<b>227</b>	<b>294</b>	<b>66</b>	<b>133</b>	<b>65</b>

Periods: I. 09/12 - 09/26; II. 09/30 - 10/14; III. 10/17 - 10/31; IV. 11/04 - 11/18; V. 11/21 - 12/05

In the trial, the greatest number of medflies and other insects captured occurred in the last lines, mainly D and E (data not shown). This may be due to the fact that the trees had not been pruned so they gave more protection to the insects.

Capture in the A line increased by the end of the trial. This was because in the first line of the plantation (to the west) there was a peach variety called "cuaresmillo," where insecticide is not used and fruit is not collected and thus suffered from strong fruit fly attack. It was used only as seed, to be grafted later. This situation was not realized in 1995 because the trial was shorter. From about October 28<sup>th</sup>, this variety allowed an increase in medfly population and in row A, the closest to this variety, there was an increase the medfly capture. During the last two periods, this was the only fruit available.

The addition of the third attractant (trimethylamine) to lures increased medfly capture, although the selectivity for *C. capitata* females decreased slightly. The results for unmated females were similar, when compared with the trial carried out in 1995, except for IPMT,,NU+B, where selectivity increased. However, it should be noted that the traps were not the same (*i.e.*,CBDT and OBDT were not used).

In general, there were no problems with the traps management, but dry traps were easier to manipulate in the field than those which used liquids for means of insect retention. There were also no problems with predators. The only inconvenience was that a small accumulation of water at the base of the dry traps on rainy days.

For unknown reasons, a Tephri trap was found once on the ground (10/07/97). On October 31<sup>st</sup>, the field activities could not be fulfilled (Tables IX and X).

The only trap, where insects caught suffered significant decomposition problems was the IPMT, FA-3, wet, mainly in spring when temperatures began increasing. At the end of the trial, with high temperatures and in this trap, there were found, besides medflies in good conditions, just the wing of *C. capitata* so the sex could not be identified. *Anastrepha* spp., however, did not suffer decomposition. The decomposition problems with arthropods, when using water as means of retention, did not occur at low temperatures.

In peach, the harvest started on October 3<sup>rd</sup>, 1997, with a very low medfly population (Table IX) and was finished on October 24<sup>th</sup> (22 days). There was a very low population of *C. capitata*, mainly of males, so fruit suffered very little harm. Additionally, the 30 traps placed in this small fruit orchard could have acted as a control method. The trials during 1995 (330 trap day) and 1997 (425 trap day), were carried out in the same orchard (Pomancillo Oeste) and they started on the same date (September 12<sup>th</sup>). However, the trials did not last the same length of time and the same traps were not compared. The appearance of females of *C. capitata* occurred faster than males (in both trials). This was probably because males need different environmental conditions to appear. In both trials the harvest was carried out with a very low male population.

The maximum indexes of F/T/D in the trial were: IPMT, FA-3, DDVP: 14.67; IPMT, FA-3, wet: 8.26; JT, TML: 6.20; Tephri, FA-3, DDVP:5.60; IPMT, NU+B: 5.10 and ST, FA-3, DDVP: 2.55. These indexes are the sum of F/T/D of females and males of Table X. The maximum indexes were obtained at the end of the trial, without fruit on the trees, except for the "cuaresmillo" variety.

During the trial 444 flies of genus *Anastrepha* (Diptera: Tephritidae) were caught and more than 90 % were *A. fraterculus*. The most efficient trap for the capture of *Anastrepha* spp. was IPMT, NU+B with 315 flies (70.94 %), followed by IPMT, FA-3,wet with 73 flies (16.44 %), IPMT, FA- 3, DDVP with 28 flies (6.31 %), ST, FA-3, DDVP with 26 flies (5.86 %), and Tephri, -FA-3, DDVP with 2 flies (0.45 %). The ST, FA-3, DDVP caught 26 *Anastrepha* spp. (16 females and 10 males) the same day (December 2<sup>nd</sup>, 1997) in the row A (data not shown).

The highest RTE for capturing females of *Anastrepha* spp. was also IPMT, NU+ B with 71.61 %, followed by IPMT, FA-3,wet with 15.48 %, 7.1% for IPMT, FA-3, DDVP, 5.2% with ST, FA-3, DDVP and 0.6% with Tephri, FA-3, DDVP.

TABLE XII. METEOROLOGICAL DATA - 1994 - (METEOROLOGICAL STATION, NATIONAL INSTITUTE OF AGRICULTURAL TECHNOLOGY, VALLE VIEJO)

Month	Max. T.	Min. T.	Mean. T.	Max. R.H.	Min. R.H.	Mean R.H.	Wind - km/m	Rain
	° C Absolute	° C Absolute	° C	Mean (%)	Mean (%)	(%)	Mean	(mm)
JAN.	39.0	16.0	27.4	70.6	37.0	53.8	9.3	115.0
FEB.	37.0	13.0	24.5	80.6	44.9	62.8	9.0	142.8
MAR.	35.0	12.5	23.8	71.9	42.6	57.3	6.1	6.0
APR.	33.0	9.0	22.2	81.6	43.6	62.7	6.6	20.5
MAY	32.0	6.5	18.7	87.7	46.9	67.3	5.7	9.4
JUN.	26.2	-2.0	14.3	82.3	37.0	59.6	5.6	0.5
JUL.	27.2	-6.5	11.3	80.6	39.1	59.8	5.2	10.0
AUG.	31.5	-1.0	16.4	66.9	32.7	49.8	7.5	0.1
SEP.	42.0	-2.5	20.7	65.5	36.3	50.9	8.9	4.0
OCT.	38.5	8.5	22.2	67.7	46.1	56.7	9.2	29.8
NOV.	37.5	13.0	25.2	71.1	39.4	55.3	10.5	23.0
DEC.	42.0	16.5	28.2	68.5	36.4	52.5	10.7	89.0
<b>Annual</b>	<b>42.0</b>	<b>6.5</b>	<b>21.2</b>	<b>74.6</b>	<b>40.2</b>	<b>57.4</b>	<b>7.9</b>	<b>450.1</b>

TABLE XIII. METEOROLOGICAL DATA - 1995 - (METEOROLOGICAL STATION, NATIONAL INSTITUTE OF AGRICULTURAL TECHNOLOGY, VALLE VIEJO)

Month	Max. T.	Min. T.	Mean. T.	Max. R.H.	Min. R.H.	Mean R.H.	Wind - km/m	Rain
	° C Absolute	° C Absolute	° C	Mean (%)	Mean (%)	(%)	Mean	(mm)
JAN.	40.5	15.0	27.2	74.8	41.4	58.1	9.2	20.3
FEB.	36.7	15.0	25.5	73.6	38.6	56.1	8.0	35.0
MAR.	35.5	14.0	25.9	80.3	44.0	62.2	8.7	45.0
APR.	35.5	4.5	21.6	79.4	38.6	58.8	6.7	0.5
MAY	30.5	2.2	16.4	88.2	42.3	65.3	5.2	13.5
JUN.	27.5	0.5	12.9	87.2	43.7	65.4	5.3	0.1
JUL.	27.7	0.0	11.9	83.5	39.7	61.6	5.0	0.0
AUG.	36.8	-1.0	15.1	75.0	39.4	57.2	6.9	0.0
SEP.	35.5	4.0	18.9	67.2	33.7	50.4	8.2	2.0
OCT.	41.0	9.0	23.3	63.8	33.8	48.8	9.8	2.2
NOV.	40.7	14.0	24.8	64.6	34.4	49.5	10.1	75.7
DEC.	41.1	14.0	28.4	66.5	31.1	48.8	9.6	44.2
<b>Annual</b>	<b>41.1</b>	<b>-1.0</b>	<b>21.0</b>	<b>75.3</b>	<b>38.4</b>	<b>56.9</b>	<b>7.7</b>	<b>238.5</b>

TABLE XIV. METEOROLOGICAL DATA - 1996 - (METEOROLOGICAL STATION, NATIONAL INSTITUTE OF AGRICULTURAL TECHNOLOGYVALLE VIEJO)

Month	Max. T.	Min. T.	Mean. T.	Max. R.H.	Min. R.H.	Mean R.H.	Wind - km/m	Rain
	° C Absolute	° C Absolute	° C	Mean (%)	Mean (%)	(%)	Mean	(mm)
JAN.	39.0	15.5	26.5	77.4	36.0	56.7	8.6	64.0
FEB.	39.5	12.0	26.1	78.4	43.1	60.8	10.0	26.0
MAR.	38.0	15.5	25.6	75.3	38.6	57.0	9.1	57.0
APR.	32.0	7.0	19.7	90.2	56.8	73.5	6.8	38.1
MAY	30.7	1.2	18.4	93.7	58.3	76.0	6.6	0.9
JUN.	27.0	-5.0	10.4	98.7	58.7	78.7	3.4	19.0
JUL.	26.6	-4.0	11.9	91.0	46.6	68.8	5.6	0.0
AUG.	41.0	0.5	18.0	79.4	44.7	62.1	7.3	0.0
SEP.	34.5	4.5	18.0	84.3	50.2	67.3	6.7	24.0
OCT.	38.5	9.5	23.7	98.3	42.7	70.5	9.5	8.5
NOV.	31.4	20.5	26.0	90.4	45.5	68.0	14.3	20.4
DEC.	32.6	21.7	27.1	89.5	46.5	68.0	9.8	101.5
<b>Annual</b>	<b>41.0</b>	<b>-5.0</b>	<b>20.9</b>	<b>87.2</b>	<b>47.3</b>	<b>67.2</b>	<b>8.1</b>	<b>359.4</b>

TABLE XV. METEOROLOGICAL DATA - 1997 - (METEOROLOGICAL STATION, NATIONAL INSTITUTE OF AGRICULTURAL TECHNOLOGYVALLE VIEJO)

Month	Max. T.	Min. T.	Mean. T.	Max. R.H.	Min. R.H.	Mean R.H.	Wind - km/m	Rain
	° C Absolute	° C Absolute	° C	Mean (%)	Mean (%)	(%)	Mean	(mm)
JAN.	32.6	23.0	27.8	85.0	50.6	67.8	8.1	149.5
FEB.	30.2	19.2	24.7	88.2	52.1	70.1	7.3	84.3
MAR.	31.5	14.8	23.2	88.0	53.1	70.5	8.3	18.3
APR.	30.9	16.6	23.8	84.2	47.4	65.8	7.2	0.0
MAY	25.5	12.4	18.9	88.3	51.4	69.9	6.6	20.5
JUN.	20.3	5.7	12.9	96.1	52.5	74.3	4.4	0.0
JUL.	22.4	7.2	14.8	94.5	48.3	71.4	4.6	0.1
AUG.	29.3	9.6	19.4	84.8	46.6	65.7	3.1	0.5
SEP.	28.3	13.3	20.8	83.2	50.1	66.6	-	0.0
OCT.	28.8	16.2	22.5	83.4	49.2	66.3	-	15.5
NOV.	32.1	19.8	25.9	82.1	47.5	64.8	-	26.9
DEC.	34.1	15.6	24.9	69.8	39.9	54.9	-	54
<b>Annual</b>	<b>34.1</b>	<b>5.7</b>	<b>21.6</b>	<b>96.1</b>	<b>39.9</b>	<b>68.3</b>	<b>6.2</b>	<b>365.6</b>

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