

CHAPTER I

I. FIRST TERM OF REFERENCE OF THE COMMITTEE

1.1 As per the first term of reference, the Committee have been mandated to find out whether the recent findings of the Centre for Science and Environment regarding pesticide residues in soft drinks are correct or not.

II. REPORT OF CENTRE FOR SCIENCE AND ENVIRONMENT

Pollution Monitoring Laboratory

1.2 Centre for Science and Environment has set up a Pollution Monitoring Laboratory(PML) in New Delhi to monitor environmental pollution. In its report CSE has stated that PML is equipped with state-of-art equipments for monitoring and analysis of air, water and food contamination including High Performance Liquid Chromatograph (HPLC), Gas Chromatograph (GC) with ECD, NPD, FID and other detectors, UV-VIS Spectrophotometer, Mercury Analyzer, Respirable Dust Sampler, etc.

Materials and Methods

Sampling Methodology

1.3 It has been stated by CSE in its report that soft drink bottles of different brands and flavours were purchased from various markets in Delhi during the month of May, 2003. Extraction and pesticide residue analysis was carried out at the PML during the same month. Three samples of each of the 12 different brands (thirty six samples) were analyzed for 16 organochlorines, 12 organophosphorous pesticides and 4 synthetic pyrethroids. Details of the samples purchased from India are at Annexure I and the details of soft drinks samples procured from USA and tested in PML are also at Annexure I.

Equipments

1.4 Gas Chromatographs used for pesticide residue analysis were Thermoquest—Trace GC with the ⁶³Ni Selective Electron—Capture Detectors with advanced software(Chromcard-32 bit Ver 1.06 October 98) and Nucon-GC-5765 series equipped with Nitrogen phosphorous detector. GC column employed were capillary column, DB-17, J & W make and DB-5, J & W make (for cross verification). Rotatory evaporator (Buchi type) and a 10— μ l syringe from Hamilton Co. were employed.

Solvents

1.5 All the solvents acetone, methylene chloride, hexane (HPLC) grade used for the analysis were purchased from E-Merck.

Chemicals

1.6 In CSE's report it has been stated that pesticide reference standards were obtained from Sigma Chemicals USA.

Sample extraction and Clean Up

1.7 The samples were analysed by CSE by using EPA method 8081A for organochlorines by Gas chromatography and EPA Method 8141A for organo phosphorus compounds by gas chromatography: Capillary column technique.

Sample Analysis

Organochlorines and Synthetic Pyrethroids

1.8 Organochlorine (OC) and synthetic pyrethroids were analysed by Gas Chromatograph(Thermoquest-Trace GC) with Ni⁶³ selective electron-capture detector. The capillary column used was DB-17-coated with 50% methyl polysiloxane(length 30m, 1D 0.25 mm and film 0.25µm). The carrier gas and the makeup gas was nitrogen with a 0.4 ml/min-flow rate respectively employing the split less mode.

Organophosphorus Compounds

1.9 Organophosphorus(OP) pesticides were analysed by Gas Chromatograph(Nucon- 5765 series equipped with Nitrogen phosphorus detector). The capillary column used was another GLC capillary column—DB-17-coated with 50% phenyl, 50% methyl polysiloxane (length 30m, 1D 0.25 mm and film 0.25µm). The carrier gas and the makeup gas was nitrogen with 1.3 ml/min and 25-ml/min-flow rate respectively, Hydrogen at 8ml/min and Air at 80 ml/min respectively, employing the split less mode. The samples were calibrated (retention time, area count) against standard mixture of known concentration of 12 organophosphorus pesticides. Each peak was characterized by comparing relative retention time with those of standards.

Calculations

1.10 All calculations were done as described in US Environmental Protection Agency (USEPA) method and the amount of residues in samples were obtained.

Recovery

1.11 Recovery experiment was done as mentioned in extraction methodology, a known amount of standard pesticides was injected in the sample before extraction, to check how much were recovered after complete exercise. Generally with the ten set of extraction one recovery experiment was performed. Recovery was 90% for OCs, 85% for OPs and 88% for synthetic pyrethroids. The reproducibility of results for all the pesticides was 95% and above for all the samples. However, the mean average reading of a individual sample analyzed in triplicate, has been reported in the results.

Confirmation and quantification

Spiking

1.12 Identifications were confirmed by spiking the sample with known standard only to confirm the unknown. Thin layer chromatography of the pooled extract was also performed. Solvent systems used were hexane:benzene(4:1, v/v). The spots corresponding to the position of standards were scraped, extracted and analysed by GLC.

Dual Column

1.13 The identifications were crosschecked with another column- DB-5 coated with 5% diphenyl and 95% dimethylpolysiloxane of different polarity. Elution pattern was different from the elution pattern in DB-17.

Results

Organochlorines

1.14 The details of organochlorine pesticides detected by CSE are in Annexure II.

Y- Hexachlorcyclohexane(HCH)(Lindane)

1.15 Lindane was detected in 100% of the 36 samples analysed by CSE. Minimum concentration was detected in Diet Pepsi—0.0008 mg/L (8 times the EU limit for drinking water) and maximum concentration was detected in Miranda lemon- 0.0042 which is 42mg/L times higher than EU limit for drinking water *i.e.* 0.0001 mg/L. Average concentration of lindane detected in all the samples was 0.0021 mg/L, which is 21 times higher than the EU limit for drinking water.

DDT alongwith its metabolites (DDD+DDE)

1.16 DDT alongwith its metabolites was detected by CSE in 81% of the samples *i.e.* 29 out of 36. Minimum concentration was detected in Blue Pepsi—0.0001 mg/L. Maximum concentration was detected in Mirinda lemon—0.0042 mg/L which is 42 times higher than the maximum EU limit for drinking water. Average concentration of total DDT in all the samples was 0.0015 mg/L, which is 15 times higher than the EU limit for drinking water.

1.17 Heptachlor, aldrin, dieldrin, endosulfan, methoxychlor and chlordane were not detected by CSE in any of the samples of soft drinks tested by it.

Organophosphorus

1.18 The details of organophosphorus pesticide residues detected by CSE are in Annexure III.

Chlorpyrifos

1.19 Chlorpyrifos was detected by CSE in 100% of the 36 samples of soft drinks analysed by it. Minimum concentration of 0.0015 mg/L was detected in Sprite, a Coke product and maximum was detected in Mirinda Lemon flavour, a Pepsico product, which is 72 times higher than the EU limit for drinking water. Average concentration of 0.0042 mg/L of chlorpyrifos was detected in all the samples (that is 42 times higher than the EU limit for drinking water).

Malathion

1.20 CSE has reported that Malathion was present in 97% of the 36 samples analysed by it. Minimum concentration of 0.0013 mg/L was detected in Sprite and maximum concentration was in Mirinda Lemon—0.0196 mg/L which is 196 times higher than the EU limit for drinking water. Malathion was present in all samples except one sample of Sprite (BN 787).

Synthetic Pyrethroids

1.21 None of four synthetic pyrethroids—Permethrin, Deltamethrin, Cypermethrin and Fenvalerate—was detected by CSE in any of the soft drink samples tested by it.

Total pesticide residues

1.22 The range of concentration of total pesticides (Organochlorines and Organophosphorus) , in the 12 brands of soft drinks tested by CSE, varied from 0.0055—0.0352 mg/L. Minimum value of 0.0055 mg/L was detected in Sprite which is 11 times higher than the EU limit for drinking

water and maximum value was detected in Mirinda Lemon—0.0352 mg/L which is 75 times higher than the total EU limit for drinking water of 0.0005 mg/L. Average concentration of total pesticides detected by CSE was 0.0168, which is 34 times higher than the total EU limit for drinking water.

Samples procured from USA

1.23 CSE in its report stated that it has also analysed the samples of Coca Cola and Pepsi Cola procured from the USA. No pesticide residues were detected by CSE in the Coca Cola and Pepsi samples procured from the USA manufactured by the same multinationals.

III. REPORTS OF GOVERNMENT LABORATORIES

1.24 CSE's Report was very widely covered by electronic as well as print media. The issue was also discussed in Lok Sabha. The Minister of Health and Family Welfare informed the House that she will verify the facts and submit the same in the House. Subsequently Directorate General of Health Services (DGHS) requested the Central Food Laboratory under the auspices of Central Food Technological Research Institute (CFTRI), Mysore and Central Food Laboratory, Kolkata to analyse the samples of soft drinks sent by it. The Minister laid a statement containing the results of these two laboratories in Parliament on 21.8.2003.

(1) Report of CFL ,CFTRI, Mysore

CFL, Mysore

1.25 It has been stated in the Report of CFTRI that Central Food Laboratory(CFL) at Central Food Technological Research Institute(CFTRI), Mysore is a ISO 9001-2000 certified and NABL accredited laboratory under the aegis of Council of Scientific and Industrial Research (CSIR), New Delhi. The CFL is an appellate body under PFA Act, 1954. It has also been stated in the Report that the CFL has recently acquired its expertise and training in Human Resource Development to address the analytical aspects of contaminants like pesticides, heavy metals, aflatoxins, microbial pathogens and toxins. This has helped CFL in carrying out training of participants from customs, industries, public health laboratories, public analysts and participants from other countries.

1.26 It has been reported that this laboratory has state-of-art analytical facility including GC with ECD, NPD, FPD, HPLC with DAD, VWD, FLD and GC-MS with highly experienced and qualified personnel to carry out the specialized fields of testing.

Materials and Methods

Sampling Methodology

1.27 Samples were sent by the Directorate General of Health Services, New Delhi to CFL, CFTRI, Mysore for analysis. The details of the samples received are at Annexure-IV. DGHS had sent duplicate samples 500 ml. each of twelve brands of soft drinks from Delhi for analysis of pesticide residues especially for the ones reported by CSE, New Delhi. The 12 brands of soft drinks were analyzed by CFL for organochlorine insecticides namely HCH isomers (alfa, gamma, beta and delta), DDT and metabolites (pp DDT, DDE and DDD), Endosulfan I, II and Sulfate, Heptachlor Epoxide, Chlordane and organophosphorus insecticides namely Methylparathion, Chlorpyrifos, Fenitrothion and Malathion.

Equipment

1.28 CFL has used HP6890 Gas Chromatograph fitted with Ni⁶³ μ -ECD, NPD and Shimadzu GC 2010 with FPD for the quantification of organochlorine and organophosphorus insecticides. The columns used were HP 50+ equivalent to DB-17 and BPX5 equivalent to DB-5. Perkin Elmer Turbomass Gold GC-MS connected to Autosystem XL GC was used for confirmation.

Solvents

1.29 All the solvents used like Methylene chloride, Hexane, Acetone used were of HPLC grade from E-Merck.

Sample Extraction

1.30 The samples were analysed using US Environmental Protection Agency (USEPA) method 8081A for organochlorines by gas chromatography and EPA Methods 8141A for organophosphorus compounds.

Cleanup

1.31 Cleanup was done by USEPA method 3620B using florisil activated at 130°C overnight and cooled in a desiccator before use.

Chemicals

1.32 Pesticide Certified reference standards were obtained from Sigma Chemicals, USA.

Calculation

1.33 All calculations were done as described in USEPA/AOAC method.

Recovery

1.34 Recovery experiments were done in all the twelve brands of soft drinks sent to the laboratory for analysis spiking with 0.1 ppb of pesticides. The recovery was greater than 90%.

Confirmation and quantification

1.35 Confirmation of the pesticide detected was carried out by dual column technique using HP 50+ and BPX 5 columns and GC-MS.

GC-MS Methodology

1.36 GC-MS analysis was carried out by CFL using Perkin Elmer Autosystem XL Gas Chromatograph coupled with Turbo Mass Gold Spectrometer. Selected Ion Monitoring (SIM) technique was employed for the analysis of a mixture of standards (0.05 ppb each prepared in 1 ml hexane) as well as analytical samples for the confirmation of the likely presence of pesticides and also for the determination of their levels in the samples. For each analyte, five most abundant and characteristic peaks ($m/z > 100$) were selected for monitoring.

GC-MS analytical conditions employed by CFL for the analysis are as follows:—

Inj Temp	:	200° C
Det Temp	:	225° C

El	:	70 eV
Injection Volume	:	1 μ l direct injection
Carrier gas	:	Helium; 1ml/min
Column	:	Elite-5 (Cross bond 5% diphenyl-95% dimethyl Polysiloxane); 30m, 0.25mm i.d., 0.25 μ m film thickness
Temp.Program	:	180°(10)/5°/210°C

RESULTS

1.37 A total of 12 brands of soft drinks were tested for 14 organochlorine and organophosphorus insecticides.

Organochlorine pesticide residues

1.38 The details of organochlorine pesticide residues detected by CFTRI are in Annexure—V.

1.39 Lindane was present in 100% of the samples. The concentration ranged from 0.000008 to 0.00014 mg/L. 33% of the samples exceeded EU limit for drinking water in the range 1.1 to 1.4 times the EU limit for drinking water.

1.40 DDT and its metabolites were present in 58% of the samples ranging from 0.00018 to 0.00124 mg/L. DDT and metabolites exceeded the limit in the range 1.8—12.4 times the EU limit for drinking water.

Organophosphorus pesticide residues

1.41 The details of organophosphorus pesticides identified by CFTRI are in Annexure VI.

1.42 Chlorpyrifos was present in 100% of the samples analyzed and it exceeded the limit in 75% of the samples. Chlorpyrifos residue exceeded the EU limit for drinking water by 3.9 to 7.8 times.

1.43 Malathion was not detected in any of the 12 samples analysed by CFTRI.

(2) Report of CFL, Kolkata

1.44 CFL, Kolkata did not provide any information, in its analysis report of the different brands of soft drinks provided by DGHS, on materials used and methods adopted by it. The details of the samples received by CFL, Kolkata are at Annexure—VII. In reply to a question of the Committee, it has submitted the following information on equipments used and procedure adopted by it during the analysis:—

1.45 Equipments used

- (i) Gas chromatograph Model 5890 Series II (Hewlett Packard, USA) with Auto Sampler and Auto Injector and Ni⁶³ Selective Electron Capture Detector for Organochlorine and Nitrogen Phosphorus Detector for Organophosphorus compounds.
- (ii) Nitrogen Gas Generator
- (iii) Hydrogen Gas Generator
- (iv) Rotary Vacuum Evaporator

(v) Capillary Column Used

DB-17 coated with 50% phenyl and 50% Methyl Siloxane, length 30m, ID 0.25mm and film 0.25 μ m.

(vi) Column used for cross checking:

DB-5 coated 5% Diphenyl and 95% Dimethyl Polysiloxane, length 30m, ID 0.25mm and film 0.25 μ m.

(vii) GC conditions:

Carrier Gas Nitrogen, Flow Rate 0.4ml/min, Volume of Injection 2 μ l

Injector Temp.-270°C

Oven Temp. kept at 120°C with hold time 1 minute then from 120°C to 205°C at a rate of 25°C per minute with a hold time 1 min and then finally from 205°C to 290°C at a rate of 2°C per minute with a hold time 12 minutes.

The time length for total run: 59.9 minutes

The detector is maintained at 320°C

The result and calculation are made using Chemstation Software Version

A 05.01 from Hewlett Packard, USA

1.46 Procedure Adopted

- (a) The sample was homogenised and filtered through Whatman No. 1 filter paper.
- (b) 500 ml of the filtered sample was taken in a 1 litre capacity beaker. PH of the sample was measured with a pH Meter (Metrohm, Switzerland, Model: 716 Titron) and the pH of the sample was found acidic 2.4-3.3)
- (c) The sample was neutralised by (N/10) NaOH solution [AR grade NaOH was dissolved in Milli-Q water (Millipore Corporation, USA)]
- (d) The neutralised sample was transferred into a separatory funnel (1 litre capacity) quantitatively.
- (e) To it 20 ml of saturated NaCl solution was added. A.R. Grade NaCl activated at 450°C, \leq 4 hrs. was used for this purpose.
- (f) 100 ml CH₂Cl₂ (HPLC grade Merck) was added and shaken for 2-3 minutes and allowed to separate (approx. 30 minutes required for clear separation of the two layers)
- (g) The lower H₂Cl₂ layer was collected in another 1 litre capacity separatory funnel.
- (h) Extraction with 100 ml CH₂Cl₂ was repeated twice.
- (i) The combined extract (CH₂Cl₂) was filtered through anhydrous Na₂SO₄ (ACS Grade), activated at 450°C \leq 4 hrs. The filtrate was collected in a 500 ml round bottom flask.
- (j) Concentrated to 1—2 ml using rotary vacuum evaporator (Eyela, Japan).
- (k) Quantification of florasil by Lauric acid method:—

Thus, 20 gms of florasil used for column preparation.

(l) Preparation of column:—

Column id: 20 mm.

Column length: 25 cm.

Florisil (Aldrich, USA) [activated overnight at 130°C].

Mesh size: 60—100

Na₂SO₄: 1-2 cm in length at the top of the florisil,

Glass Wool

Sequentially Glass Wool, Florisil and Na₂SO₄ were taken in the column and re-eluted with 100 ml n-Hexane.

- (m) To the extract at step (j), 10 ml CH₂Cl₂ was added, and the extract poured on the top of the column.
- (n) Sequentially (i) 100 ml n-Hexane (ii) 100 ml of 30% CH₂Cl₂ in n-Hexane and finally (iii) 100 ml CH₂Cl₂ was passed through the column.
- (o) The entire eluant from the column at step (m) & (n) was collected in 500 ml round bottom flask.
- (p) Evaporated to dryness using rotary vaccum evaporator.
- (q) Final volume of the residue was made upto 5 ml in a duly calibrated and graduated centrifuge tube with Methyl-tertiary-butyl-ether (HPLC grade).
- (r) Determination of residue by Gas Chromatograph.

The details of the organochlorine and organophosphorus pesticide residues found by CFL, Kolkata are in Annexures VIII and IX respectively.

IV. COMPARISON OF METHODS, PROTOCOLS AND EQUIPMENTS USED BY THE THREE LABORATORIES

1.47 The details of the various methods, protocols and testing equipments used by CSE, CFL-CFTRI and CFL, Kolkata are summarised in Annexure—X.

1.48 In a written reply to a query of the Committee, whether the methodology adopted by CSE is wrong as per prescribed USEPA methodology, CFTRI has stated as below:—

- (i) CSE has quoted that they have adopted EPA method for organochlorine and organophosphorus insecticides (8081 and 8141). However, they have deviated the column clean-up for pesticide residues wherein they have eluted the column with Hexane and Dichloromethane mixture. In the EPA procedure (3620B) florisil column cleanup is with Ethyl ether and hexane mixture. We are not aware why this deviation has been done. The rate of elution of column with 5 ml/min of Dichloromethane is too fast and no cleanup is achieved. Hence we have done at 2 ml/min which cleans up the material and we get a better baseline. CSE clarified in this regard that the Gas Chromatographic technique is used for qualitative and quantitative analysis of the components of a mixture. It is a highly sophisticated technique which can be used only by experts who have to optimise parameters to get the best resolution. According to the given methodology, "the analyst is permitted to modify GC column, GC conditions, concentration techniques (*i.e.* evaporation techniques), internal standards or surrogate compounds". CSE has further stated that hexane and

dichloromethane mixtures have also been recommended for clean-up. CSE has also clarified that the elution flow rates of the solvents have to be optimised by the analyst. The flow rates etc. given in the method are only indicative.

- (ii) While carrying out GC analysis, CSE has chosen higher oven temperature ramp (25°C/min) resulting in higher oven temperature within a shorter period. As very high temperature is reached in shorter duration, there will be poorer resolution of residues and they may get merged into a single peak resulting in higher area and thus showing higher value for the pesticide residues, whereas in EPA, the temperature rise is 2.8°C/min. We have followed the oven temperature ramp of 2°C/min giving us better results and excellent resolution and not merging of peaks. In reply to the above contention, CSE stated in a written note that the conditions such as carrier gas flow rate, temperature of injector, detector temperature and temperature programme specified in US EPA methodology are indicative and not rigid. They are optimised in actual practice during experiments and may, therefore, vary with column and instrument used.
- (iii) The pesticide confirmation suggested by EPA is dual column and GCMS whereas CSE has followed dual column and TLC. We have used the latest development of GCMS which is confirmatory firmly based on scientific literature and is the state-of-art.
- (iv) The presence or absence of Malathion should have been confirmed by GCMS by CSE instead of TLC confirmatory keeping in view of the instability of Malathion and proper resolution in GCMS that happens for Malathion. In this regard, CSE clarified that USEPA methodology describes the "analytical conditions for a second gas chromatographic column that can be used to confirm the measurements made with the primary column". This method does not say that the results need to be confirmed by GCMS. This method further states that the GCMS method 8270 is also recommended as a confirmation technique, if sensitivity permits and further states that "GCMS may not be used for confirmation when concentrations are below 1µg/µL in the extract". It also states that "Full scan GCMS will normally require a concentration of approximately 10 µg/µL in the final extract for each single-component compound". Since the concentration of residues detected by CSE in soft drinks were below 10 µg/µL, by not using GC-MS, it has not deviated from USEPA methodology.

1.49 CFL, Kolkata observed the following differences in the methods adopted by it and CSE:—

- (i) CSE used the calibration table set up relative retention time window of 0.65% whereas CFL, Kolkata used the table set up with the relative retention time window of 0.5% which is more accurate in assessing the retention time of a particular compound.
- (ii) CFL, Kolkata used its nitrogen gas generation system producing ultra pure nitrogen of purity 99.999%, CSE remained silent about the quality of carrier nitrogen gas used. Indian Council for Medical Research (ICMR) also expressed similar opinion in this regard. CSE in a written reply stated that it also used ultra pure high purity nitrogen which is 99.99 UHP pure.
- (iii) The variation in results will occur between manual and auto injection systems.

1.50 Srisol Research Foundation, in its memorandum submitted to the Committee, has pointed out the following deviations on the methods used by CSE:—

- (i) The EPA methods used by CSE have not been validated for use on a complex matrix such as cola beverages. Therefore, there could be several co-extractives that co-elute with the target analytes resulting in potential overestimation of concentrations.

- (ii) Some of the deviations to EPA's recommended GC conditions (such as temperature program) and columns may cause co-elution and misidentification of the target analytes. CSE's position in this regard is that the USEPA method used by CSE for its tests is recommended for determining the concentration of various organochlorine and organophosphorus pesticides in extracts from solid and liquid matrices which include products like soft drinks.
- (iii) The CSE report does not provide enough information of the Analytical Quality Control (AQC) procedures to make any concrete judgements about the quality of the results.

1.51 In regard to analytical challenges in sub ppb level detection in complex matrices, Vimta Labs Ltd., Hyderabad, has stated in its memorandum as follows:—

- (i) **Matrix Interference:** Beverages have many components like sweeteners, coloring agents, preservatives, acids which require extreme care during sample preparation and extraction. Otherwise there is every possibility of non target compounds co-eluting with the target analytes and could cause wrong/overestimated results. In this regard, CSE replied that it is aware of the problems that arise while handling a complex matrix and has always taken the appropriate measures to counter those problems. Scientific methodologies clearly exist for complex materials, and CSE adopted these methodologies.
- (ii) **Sample injection:** If manual injection is used, no more than 2 micro litres should be used. Larger injection volumes could cause sample to be retained near the injection port and result in carryover from one sample to the next. CSE in this regard stated that it used no more than 2 µL for injections onto the GC columns.
- (iii) **Carrier gas:** At sub ppb detection levels not using the recommended gas (e.g. Helium) could effect separation efficiency of the peaks leading to misinterpretation of the results. CSE clarified in this regard that in scientific literature, it is well-documented that the carrier gas must be an inert or non-reactive gas. Nitrogen is such an inert or non-reactive gas.

Gas Chromatograph Mass Spectrometer (GCMS)

1.52 It has been stated in the note submitted by the Ministry of Health and Family Welfare that CFTRI has also conducted an additional sophisticated test using GCMS method for identification of the molecular structure of all the pesticides contained in the samples. The Committee had also been informed that this confirmatory test was not done by CSE. In regard to GCMS, the Director, CFTRI during his evidence stated, "In the analysis of soft drinks, GCMS is a very important technique to confirm it. Without that, there can be doubts".

1.53 In regard to confirmatory methods for organic residues and contaminants, EU Commission Directive 96/23/EC specifies the following as quoted from the Official Journal of European Communities dated 17.8.2002:-

"Confirmatory Methods for organic residues or contaminants shall provide information on the chemical structure of the analyte. Consequently methods based only on chromatographic analysis without the use of spectrometric detection are not suitable on their own for use as confirmatory methods". "Mass spectrometric methods are suitable as confirmatory methods following either an on-line or off-line chromatographic separation".

1.54 Codex Alimentarius Commission in its Report of the thirty-fourth session on the Codex Committee on pesticide residues (Alinorm 03/24) has *inter-alia* stated that for qualitative

confirmation (identity) the use of mass spectral data, or a combination of techniques based on different physico-chemical properties, is desirable. Residue data obtained using mass spectrometry can represent the most definitive evidence and, where suitable equipment is available, it is the confirmatory technique of choice.

Findings on Malathion

1.55 Malathion is an organophosphorus pesticide. According to CSE, Malathion was present in 97% samples analysed by it with an average concentration of Malathion (0.0087 mg/l) which is 87 times higher than the EU limit for drinking water. CFTRI and CFL, Kolkata could not find Malathion in any of the samples tested by them. In this regard, Director, CSE made the following submissions during evidence:—

“If you look at the first difference of Govt. laboratories, a very big difference has come because of Malathion....But we are sure we found Malathion. Govt. laboratories did not find Malathion. So, what could be reasons? I mean, since we have got the reports of Govt., we have also tried to re-examine it. Obviously, we should not assume that we were correct. We should try and re-investigate why the difference?... First, we reconducted the experiment using both an ECD as well as NPD detectors. Basically, looking at the detectors, we redid the experiment to see whether we were still getting Malathion peak or not. We did this experiment once again using two different columns of different polarity.”

1.56 In this regard, the Director, CSE also made the following visual presentation to the Committee:—

- (i) Peak re-detected by ECD and NPD detectors.
- (ii) Reconfirmed by using two columns of different polarity.

1.57 The Director, CSE further narrated the re-experiments on Malathion as under:—

“So what we did was to experiment using a standard of Malathion that was oxidised using hydrogen peroxide. Malathion got oxidised to Malaxaon and the Malathion peak disappeared in the chromatograph. So, we repeated this experiments with the sample of soft drinks. And repeating it, we showed that there was a peak of Malathion in the soft drink. Then we treated that sample with our hydrogen peroxide and Malaxaon peak was detected, which essentially confirms the presence of Malathion and that it was not an impurity.”

1.58 In this regard, the Head of CFL, CFTRI, Mysore during the evidence stated, “We have tested the sample for Malaxaon also by using bromination and H_2O_2 treatment. However, we have not found Malaxaon also. Actually in the soft drinks because it is pH 2.8 or something like that, there is no chance of formation of Malaxaon. It is in acid condition. You get ester of Mercapto Succinic Acid and Dimethylthiophosphoric acid and not Malaxaon.” CSE in a written reply has stated in this regard that presence of a degradation product like Mercapto Succinate in soft drinks does not affect this reaction and is aware that no useful purpose is likely to be served in attempting to convert Mercapto Succinate (a component of Malathion) back to Malathion.

1.59 In regard to another experiment conducted by CSE to confirm the presence of Malathion, the Director, CSE informed the Committee, “We did another experiment. One of the peak issues with Malathion is, as I said, it degrades very fast and hydrolyses when it becomes alkaline. New USEPA methodology, which we have followed to do the testing, needs the sample to be extracted at a neutral pH. But soft drinks are highly acidic.... I think, what we had done was because they

are highly acidic and the process requires that we extracted at a level you add NaOH to make it neutral. Now during the extraction, just in case the pH is raised above 'seven', the Malathion will get hydrolysed. For each unit of increase in the pH, the hydrolysis increases ten times. We repeated this experiment and confirmed it in our laboratory, and we found that the soft drink at neutral pH showed Malathion. But at alkaline pH the Malathion was completely hydrolyzed. So, from all these experiments, we are as clear, and as confident as possible that we did find Malathion".

1.60 In this regard another representative of CSE stated during the evidence as under:—

"Soft drink pH was 2.2 or 3.2. So, You added NaOH, a Alkali, to bring pH to neutral value. Sir, if you are not measuring it properly or if you are not careful, and you put extra alkali (NaOH) and then pH increases, let us say to 12, and Malathion disappears, then what will happen? Therefore, Sir, in any experimental work, there are certain sources of error.... Therefore, possibly, work being done elsewhere, and they have not been careful about it. Therefore, they could not detect Malathion. We had also, in our experiments in the standard tried to detect Malaxaon. The work that was done outside, they have not tried to detect Malaxaon. If Malaxaon appears, that means, Malathion was there. This is what we have reconfirmed".

1.61 During the evidence, Director, CFTRI clarified the position of CFTRI in regard to care taken by it during estimation of Malathion as follows:—

"Malathion extracted by EPA method has been defined. PH of the extraction will not change during extraction as dichloromethane is a neutral solvent. PH will not exceed at any point. Extreme care has been exercised to ensure that pH does not cross 'seven' at any time during estimation of Malathion. It is very important. That is where the accreditation in terms of following the procedure is very important. Even if it crosses to 7.2, your estimation is wrong. It is not allowed to go to 7.2. So, care has to be taken."

1.62 A copy of presentation of CSE was made available to CFTRI and its comments on the presentation are as under:—

- (a) CSE reported the presence of Malathion in soft drink beverages which they analysed. CFTRI, Mysore and CFL, Kolkata did not find Malathion in the samples that they had analysed. One of the reasons could be CSE samples are obtained from a different batch and also collected in the month of May. CFTRI and CFL analysed the samples that were collected by DGHS and that were sent in the month of August. CFTRI adopted the same method reported by CSE as indicated by DGHS for extraction and analysed by GLC-FPD. The peaks were confirmed by dual column technique and reconfirmed by GC-MS as a final confirmatory test, which only CFTRI had done and not CSE. The above two techniques (Both GC and GC-MS) with spiking of Malathion further confirmed their absence in the sample but were clearly present in spiked samples of soft drinks as determined by CFTRI.
- (b) CSE indicates that the pH of the extract may change during pre-treatment and therefore Malathion is destroyed and hence not detected. This contention is not valid for the following reasons:
 - (i) Recovery experiments conducted takes care of such minor variations if any. These have been performed by CFTRI and validated. The recovery was more than 70% efficiency of spiked samples. If there was a destruction of Malathion as claimed by CSE during extraction, then even these samples would not have shown any Malathion

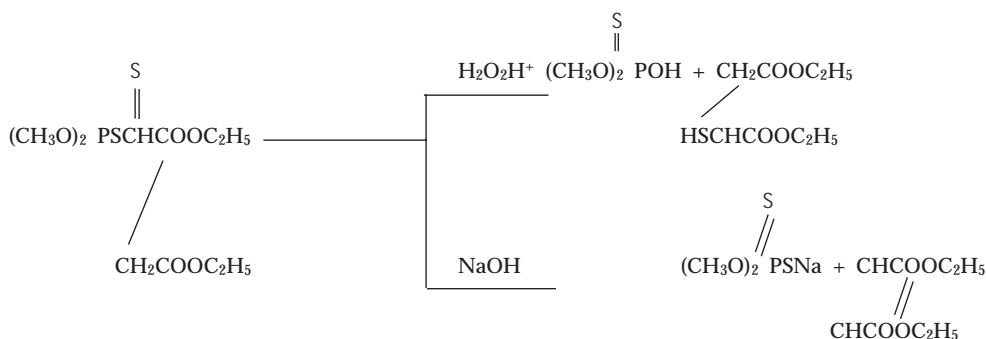
residue at all. But the results show that the spiked samples give a Malathion peak. Hence the argument advanced by CSE is not correct. However in the case of Malathion recovery is relatively less due to the unstable nature of the molecule.

- (ii) The solvent used in the extraction is dichloromethane, which is a neutral solvent. It does not contribute to either acidity or alkalinity during the extraction as claimed by CSE. Thus, the CSE contention that the pH would change during extraction is not at all scientifically correct.

In this regard, CSE stated in a return reply that CSE never said that according to EPA methodology, the sample has to be extracted at neutral pH. To do that, alkali needs to be added during sample pre-treatment to bring the pH to 7. CSE also used dichloromethane as a solvent.

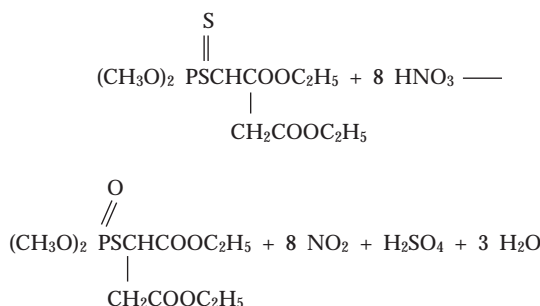
1.63 CFTRI has also explained that latest experiment conducted by CSE by adding alkali to the extractant and finding the destruction of Malathion has no relevance to EPA method. According to the EPA method it is very clear that one should not cross neutral pH. No purpose is served by doing such experiments, as it would not simulate the natural condition of EPA method for organophosphorous insecticides. CSE should have looked for alkaline degradation products instead of Malaxaon or Malathion molecules which are crucial. In this regard, CFL, Kolkata has made the following submission to the Committee:—

- (i) Malathion is unstable *i.e.* undergoes hydrolysis both in acidic and alkaline medium. Hydrolysis of Malathion follows different paths in acidic and alkali media. In acid medium the main products of hydrolysis are dimethyl dithiophosphoric acid and ester of mercapto succinic acid, while in alkaline medium the salt of dimethyldithiophosphoric acid and the ester of fumaric acid are formed:



The net result, Malathion is no longer Malathion owing to hydrolysis.

- (ii) When Malathion is oxidized by strong oxidizing agents, the thiono sulfur atom is split off and the corresponding ester of thiophosphoric acid is formed:



- (iii) Thus Malathion could not be detected by CFL, Kolkata. This is to mention here that CFTRI, Mysore also could not detect Malathion in any of their samples whereas CSE identified Malathion which was 87 times of EU limit for drinking water. It is against a chemical trustism. In this regard, CSE in a written reply submitted that it did not look for degradation products of Malathion and Malaxaon as this was not the purpose of its study. We ensured that the pH of the samples was neutral before extraction. CSE has not reported finding of Malaxaon in its soft drink samples.

1.64 Director, CFTRI made the following submission during the evidence regarding unstable nature of Malathion:—

“Malathion is an unstable molecule and degradation is rapid below pH 3. I want to point out here that the soft drink pH is 2.8. So, if there is degradation pattern or suppose you take a sample which is manufactured today you may find Malathion. May be after three months, it will degrade and you may not find. This is one of the reasons because of the instability of the molecule and the chemistry of it”.

1.65 CFTRI also informed the Committee that the presence or absence of Malathion depends upon the sample analysed.

1.66 Central Pollution Control Board Laboratory conducted an independent analysis of samples of 6 brands of soft drinks collected from various markets in Delhi. CPCB had detected Malathion in all the six samples tested by it (Annexure-XI). Four of them exceeded the EU limit for drinking water. CPCB used Agilent 6890 Series II Plus Series GC with 5973 Network for analysis of organophosphorous pesticides in extracted soft drink samples. The samples were analysed by injecting 1-2 µL of soft drink sample into GC-MS (SIM Mode). Their results come close to the results reported by CFL and CFTRI.

1.67 After CSE Report, Directorate of Health Services, Government of Kerala had sent a sample each of Coca Cola and Pepsi of soft drink for analysis to Shriram Institute for Industrial Research, Bangalore which is one of the NABL accredited laboratory for testing pesticide residues in water. This laboratory had found 0.7 ppb of Malathion in the sample of Pepsi and 9.9 ppb of Malathion in Coca Cola analysed by it. Protocol used by this laboratory was AOAC Chap.10/GC-MS(Annexure-XII).

V. DIFFERENCES IN THE RESULTS OF THE THREE LABORATORIES

1.68 A comparative chart on total pesticide residues detected by CSE, CFTRI and CFL, Kolkata is at Annexure-XIII. It is evident from the results reported by all the three laboratories that there are significant differences. Moreover, the analysis of results of individual pesticides present in the samples tested by CSE, CFTRI and CFL clearly reveals that there are wide variations in the results between CSE and the Govt. laboratories. However, the presence of pesticide residues is a scientific finding of all the three laboratories (Annexure-XIV).

1.69 The following reasons have been adduced by CFTRI for variations between the results of CSE and CFTRI:—

- (i) Variation in batch number and date of manufacture;
- (ii) Interfering substances (colours, preservatives and flavours, etc.);
- (iii) Extraction and clean-up procedure not perhaps adequate;
- (iv) Confirmatory tests by GC-MS;

- (v) Calibration of equipments and glasswares must be done routinely as results are in ppb;
- (vi) Authentic Pesticide Standards and purity of chemicals used must be established;
- (vii) Instrument sensitivity for trace level analysis need to be assured continuously;
- (viii) Analytical skill of the analyst and his/her training and the samples handled routinely makes a difference;
- (ix) Validation of the methodology if any deviation from standard procedure;
- (x) Accreditation is very important for standardization of measurements (Laboratory accreditation is absolutely essential and must be mandatory where analysis is done involving public safety and claims are made which involves not only the safety of the customer and consumer but also the correct scientific claims).

1.70 CFTRI has claimed that all the above variations many a time become additive in error bars or sometimes cancel each other by giving wrong results and hence internal spiking of standards and networking of laboratories for validation and carry validation on a continuous basis both nationally and internationally is a must. Accreditation and quality system should be mandatory and perhaps there is no choice on this.

1.71 Vimta labs Limited, Hyderabad in its memorandum has specified that the highly specialised area of pesticide residue analysis especially at sub-parts per billion level calls for the following:—

- (i) Laboratory's expertise and experience including knowledge of international procedures adopted;
- (ii) Special laboratory designs to avoid contaminations during the testing process;
- (iii) High pure chemicals and consumables required in trace analysis;
- (iv) Reference standards with traceability;
- (v) Suitable equipment: GC-ECD/FPD/PFPD, GCMS-MS, LCMS-MS;
- (vi) LCMS-MS deployment is becoming order of the day globally;
- (vii) Clean power supply to assist chromatographic equipment to maintain stable base lines.

VI. BATCH NUMBERS OF SAMPLES OF SOFT DRINKS

1.72 The details of the batch numbers, date of manufacture, manufacturers etc. of the samples of soft drinks analysed by the three laboratories are given in Annexures I(CSE), IV(CFL-CFTRI) and VII(CFL,Kolkata).

1.73 Perusal of the above mentioned details reveals that CSE analysed three samples of each of 12 brands of soft drinks and has taken the average of the results of the three samples of each of the brand. In this regard it is pertinent to note that each of the three samples of all the 12 brands of soft drinks were from different batches and date of manufacturing was also different in most of the samples. CSE samples were collected in May 2003 while samples sent by DGHS to Mysore and Kolkata were collected in August, 2003.

1.74 In regard to samples analysed by CFTRI, Mysore and CFL, Kolkata, 6 samples were bearing different batch numbers and rest of the samples were of the same batch and date of manufacture.

1.75 CSE purchased its samples of soft drinks from the open market in Delhi. However, 19 out of the 36 samples came from one bottling unit in Jaipur, 15 from one bottling unit in Hapur Tehsil in Ghaziabad and one from a bottling unit in Jodhpur and one from a bottling unit in Mathura (Annexure-I). 12 samples of soft drinks tested by CFTRI, Mysore and CFL, Kolkata were sent from Delhi by DGHS, New Delhi. In the case of both CFTRI and CFL seven samples were sent from the bottling plant located at Jaipur and five from the bottling plant situated in Ghaziabad. The samples of soft drinks tested by CSE were manufactured in the months of March, April and May, 2003. The exact dates of manufacture of the samples are given in Annexure-I. The samples of soft drinks sent by DGHS to CFTRI, Mysore were manufactured in the months of March, April, May, June and July, 2003. The exact dates of manufacture of the samples are given in Annexure-IV. The samples of soft drinks sent to CFL, Kolkata were manufactured in the months of April, May, June and July, 2003. The exact dates of manufacture of samples are given in Annexure-VII.

1.76 Since the batch numbers of samples tested by CSE and CFTRI were different, CFTRI has stated in its 'Report of analysis of pesticide residues in soft drink samples sent by DGHS' as follows:—

“As the samples analysed at CFL, CFTRI, Mysore were entirely from a different batch than the CSE samples, the results obtained are not comparable with the results of CSE”.

1.77 During the evidence, the Director, CSE also stated that the differences in the results of different laboratories could possibly be due to different batch numbers.

1.78 In regard to the comparison of results of CSE and CFL, Kolkata, it has been stated by CFL, Kolkata in a written reply as follows:—

1. CFL, Kolkata analysed 12 different brands of soft drinks having batch numbers different from those of the samples analysed by CSE, New Delhi.
2. The manufacturing date of different brands of samples of soft drinks for CFL, Kolkata had been May/June/July, 2003 whereas with CSE the manufacturing dates were March/April/May, 2003. The samples analysed by both the laboratories are totally different. Hence the results cannot be compared.

1.79 As such, CSE, CFTRI and CFL, Kolkata have all put forward the difference in batch numbers and manufacturing dates as one of the reasons for variations in their results. CFTRI, Mysore has stated in a written reply that this should have been taken care of by DGHS in picking up the market samples sent for analysis to both CFL, Mysore and CFL, Kolkata. However, the results of both CFL Mysore and CFL, Kolkata and CSE's results do show the presence of pesticides in soft drinks. The levels may be different and some of the pesticides may be present in one laboratory but absent in the other. Therefore, CFTRI strongly feels that the committee must take the cognisance of pesticide residues as a common scientific finding from all the three laboratories.

VII. ACCREDITATION STATUS OF THE LABORATORIES

1.80 Laboratory accreditation is a procedure by which an authoritative body gives formal recognition of technical competence for specific tests/measurements based on third party assessment and following international standard.

1.81 National Accreditation Board for Testing and Calibration Laboratory (NABL) is an autonomous body under the aegis of Dept. of Science and Technology, Government of India, and is registered under the Societies Act. NABL has been established with the objective to provide Government, Industry Associations and Industry in general with a scheme for third-party assessment of the quality and technical competence of testing and calibration laboratories. Government of India has authorised NABL as the sole accreditation body for Testing and Calibration laboratories in India. NABL has established its Accreditation System in accordance with ISO/IEC Guide 58, which is followed internationally.

1.82 NABL provides means to the laboratories to let them know whether they are meeting the bench mark meant for determining their own competence, to demonstrate their global equivalence in testing, to know the current trend of scientific and technical factors to update their working like estimation of uncertainty in measurements and apply this factor for giving opinion on a product. NABL conducts courses for the laboratories to make them understand the global standard and requirements.

Accreditation Status of CSE

1.83 In reply to a query during the evidence, whether CSE applied for accreditation or not, the Director, CSE stated, " No, because it takes time. You have to run the laboratory for some time. If you look at the accreditation of laboratories, these are really a handful of laboratories which are accredited. In fact, we are practising what is called good laboratory practices. We are going to apply. It takes a little time to establish". In regard to the above contention of CSE, the Secretary, Department of Science and Technology stated during evidence that NABL is a voluntary third party accreditation programme. There is no compulsion in this country. In fact, in any other places also it is voluntary in nature.

1.84 When it was asked why some institutions apply for accreditation and others not, the Secretary, Deptt. of Science and Technology replied:

"Those institutions who are carrying out tests on products which are in the international market place and if those are from accredited laboratories, then their test results could be accepted.... Some institutions do not come to us because, say, you have an equipment for accreditation. We would ask them whether this equipment regularly get calibrated or not. Has it been tested for its worthiness after its installation? Is it being operated by people who are qualified to operate this equipment? Sometimes, there are embarrassing questions.... Obviously, such labs do not get accreditation. It takes time for giving accreditation. It is because first we ask them to prepare a manual before making an application. When we send our expert team to visit those laboratories to determine their compliance to our norms and tell them where all they are lagging. There is an opportunity for them to get it corrected. Then they come back to us saying that they have corrected all those non-conformances. Then again an Expert Committee examines the submitted facts and then if they are satisfied with requirements, accreditation is given. This procedure takes time. There is an advantage in taking accreditation and that is why people come to us. We do not pressurize anybody to do it".

1.85 When it was asked how they evaluate the results of a non-accredited laboratory, the Secretary, Deptt. of Science and Technology replied, "We make no comments because I do not know what he has. So, I cannot comment on those results". In regard to CSE, he stated, "CSE has not come to us. So, I cannot say what is their competence". To the very reason, he expressed his inability to comment on the results of CSE. However, during the course of the evidence, he had further stated in this regard, "I have only said that they have not been

accredited by us. I have not said that their results are not reliable or reliable. The truth of the matter is that till this controversy erupted, there was no requirement of anybody's seeking pesticide residues in drinking water to this level. So, obviously, the laboratories did not come for accreditation. When there is need, they will do it".

Accredited Status of CFTRI and CFL, Kolkata

1.86 In regard to accreditation status of CFTRI, Mysore, the Secretary, Deptt. Of Science and Technology stated:—

"CFTRI, Mysore is one of the CSIR laboratories. They have got accreditation for close to 200 measurements. Pesticide residue in drinking water is not one of them. So, if there is a result from the CFTRI on pesticide residue, I will say, 'Sorry, I have no comments on that'."

1.87 He had also confirmed that CFL, Kolkata is not an accredited laboratory. It has also been confirmed by NABL that if an accredited laboratory carries out tests in other areas for which it is not accredited then the accreditation status does not cover such tests. It was further confirmed by the Secretary, Deptt. of Science & Technology that no laboratory in the country has been accredited for analysing soft drinks.

1.88 Subsequently, CFTRI, Mysore, and CFL, Kolkata were asked whether they have accreditation for testing pesticide residues in drinking water. The replies of CFTRI and CFL, Kolkata are given under:—

CFTRI

CFTRI is an approved testing laboratory as an appellate laboratories under the PFA Act, 1954 CFTRI, Mysore has been certified by ISO-9001 for Research and Development and testing of food from 21st April, 2000. Therefore, under ISO-9001, all the tests conducted on foods, prepared foods including water and soft drink beverages follows international system of quality assurance and the tests conducted under such provisions are internationally accepted for the Quality Systems which include use of Standards and Reference Materials. CFTRI, Mysore was also accredited by NABL for Chemical and Biological Testing from 31st December, 2001 *vide* Certificate No. T-0379 and T-0380 which included the CFL laboratory at CFTRI. The scope of accreditation in the field of chemical testing under certificate number T-0379 includes food, food grains and prepared foods for the analysis of pesticides. The CFTRI has clearly defined food and prepared food as approved by the management before going for accreditation and also wherever standards were not available at the time of accreditation, commitment was given for acquisition of reference materials and certified reference material for the analysis of any other pesticides from time to time since the procedure of experiment remains the same. The testing of pesticides under NABL requires authentic reference standards with certificate of purity traceable to NIST, USA or the national standard (NPL, New Delhi). Therefore, drinking water testing has been included under the scope of testing.

CFL, Kolkata

The laboratory published about 500 scientific and research papers in national and international journals. This scientific work frequently brings the capability and also the deficiency to the fore as many adjudicating scientists of India and abroad examine the work at the level of current state-of-the-art. No adverse comments, *suo motu* or solicited, came forward. Hence, there had

not been any idea or suggestion for accreditation of the laboratory neither there had been any demand in this regard; the relevant institution (NABL), appeared on the scene much later. Very recently the laboratory has initiated the process to undergo accreditation by NABL with the idea for its enhancement of credibility.

CONCLUSIONS/RECOMMENDATIONS

1.89 As regards the first terms of reference of the Committee, the Committee would like to divide it in two components, the first one is the qualitative (detection and identification) aspect and the second is the quantitative one (estimation and confirmation). So far as qualitative aspect is concerned, the Committee are of the view that CSE findings are correct on the presence of pesticide residues in carbonated water in respect of three samples each of 12 brand products of Pepsico and Coca-cola analyzed by them. CSE tested 36 samples for 16 organochlorine pesticides, 12 organo phosphorus pesticides and 4 synthetic pyrethroids, which together constitute a list of 32 most commonly used pesticides in India. CSE detected the gamma isomer (Lindane) in all the 36 samples and three other isomers of hexachlorocyclohexane (commonly called HCH or BHC) in some of the samples at varying levels. DDT and its metabolites were detected in 29 out of 36 samples. Among the organo phosphorus ones, chlorpyrifos was detected in all the 36 samples in varying concentrations and malathion in 35 out of the 36 samples at different levels. None of the four synthetic pyrethroids was found in any of the 36 samples.

1.90 The Committee have however, noted that 19 of the 36 samples came from one bottling unit in Jaipur, 15 from one bottling unit in Hapur Tehsil in Ghaziabad, one from a bottling unit in Jodhpur and one from bottling unit in Mathura.

1.91 CFL-CFTRI (Central Food Laboratory at Central Food Technological Research Institute, Mysore) and CFL, Kolkata (Central Food Laboratory, Kolkata) analyzed independently samples of the same 12 brands collected and sent to them by Directorate General of Health Services. Both laboratories also detected the presence of organochlorine and organophosphorus pesticide residues. The presence of pesticide residues, therefore, is a common scientific finding of all the three laboratories. The Committee would, therefore, conclude that CSE stands corroborated on its finding pesticide residues in the carbonated water. So far as non-detection of malathion by the two laboratories is concerned, the Committee attribute the same to the variations in different batch numbers, manufacturing locations and also the dates of collection and analysis. The absence of malathion in the Mysore and Kolkata analysis have been scientifically explained by CFTRI. GCMS method has been applied to confirm the absence of malathion, reinforced by spiking samples and analysis. The Committee also note that the presence of malathion was also reported by the laboratory under the Central Pollution Control Board and Shriram laboratory (Bangalore) and hence out of the five laboratories three had detected malathion in the samples tested by them.

1.92 With regard to the quantitative aspect, the results of CSE on the one hand and CFL-CFTRI and CFL, Kolkata on the other vary widely. The Committee have no hesitation in admitting that as explained by different experts who deposed before the Committee, variations in an analytical research is a well known factor. It can arise due to host of other factors such as differences in (a) the manufacturing locations, (b) date of manufacture, (c) batch number of products, (d) temperature conditions of storage at the stocking place/retail end, (e) the laboratories due to the differences in the analytical techniques/procedures, (f) structural stability and (g) characteristics of the chemical molecule in question etc. In the instant case, there have undoubtedly been variations in the samples which had different batch numbers and also were manufactured at different locations. Though all the three laboratories have employed the same

analytical procedure namely US Environmental Protection Agency Method 8081A for organochlorine and 8141A for organophosphorus pesticide, differences have been noticed in the way the procedure was performed as enumerated in Annexure X, with the result that the differences could be significant.

1.93 Moreover, CFL of CFTRI was able to apply GC Mass spectrometry combination for confirmation of its results—the importance of which has been highlighted by a number of experts who appeared before the Committee. Besides, though CSE has reported that the concentration level of pesticide identified in carbonated water was far in excess of the limit laid down in EU directives, however, the Committee are of the view that comparing residue level in any article of food on a percentage basis could have been avoided because EU norms were not adopted at that point of time in our country. The results of CFL, Mysore and CFL, Kolkata however come closer to each other in terms of the number of times the total pesticides level exceeded the EU limit, in the specific batches. For the results to be compared in the quantitative terms, all the three laboratories should have adopted the same protocol in the design, conduct and interpretation of results of the study. Besides, CFL-CFTRI and CFL Kolkata are among the four laboratories established under the Prevention of Food Adulteration Act, 1954 with a mandate to carry out the functions entrusted under the PFA Act, as amended and notified on 30 December, 2002. The broad jurisdiction of these four laboratories has been notified under the PFA Rules, 1955. These are, therefore, approved and authorized laboratories to conduct food analysis including beverages and packaged drinking water. In addition CFTRI under which CFL functions has been accredited by NABL for both chemical and biological testing. CFTRI is also an ISO/9000:2000 certified organization. On the other hand CSE has not cited any accreditation from NABL or certification from ISO (International Standards Organization) to support its analytical competence. This aspect was highlighted by several organizations in their evidence and presentations before the Committee particularly CII, FICCI, ICMR and CPCB. CFL, Kolkata also does not have accreditation from NABL. Accreditation is a formal recognition of the competence of a testing laboratory and gives credence for data acceptance—a fact which has been recognized internationally also.

1.94 The European Union in fact has a long list of guidelines and directives concerning the performance of analytical methods and interpretation of results. (Council Directive 96/23 EC). The importance of adopting confirmatory methods for arriving at the authenticity of the results is equally important, since as per the EU Directive also confirmatory methods for organic residues or contaminants provide information on the chemical structure of the analyte. Consequently, methods based only on chromatographic analysis without the use of spectrometric detection are not suitable on their own for use as confirmatory methods. The fact however remains that such a test was not done by CSE. Moreover, it would have been appropriate if the evaluation of tests was conducted on the same samples by two or more laboratories in accordance with the predetermined conditions. The Committee note that although the pesticide residues were found in all the test reports with quantitative variations, however, while citing EU norms/limits for pesticides, the CSE adopted the USEPA method for analytical purposes. The Committee feel that CSE could have adopted the EU specified methodology to reach a final conclusion of pesticide residues and its follow up.

1.95 Though the results of the Central Pollution Control Board which had conducted an independent testing through their laboratory, come closer to the findings of CFL-CFTRI and CFL, Kolkata, the percentage reported by Shriram laboratory which had tested only one sample each of Coca Cola and Pepsi is quite high. In view of the fact that these laboratories also did not test identical samples and the dates of manufacturing as well as locations are different, the quantitative results reported by them cannot be compared.

1.96 The Committee, however, find that the CSE findings are correct on the presence of pesticide residues in carbonated water strictly in respect of the 36 samples of 12 brand names analyzed by them. The Committee also appreciate the whistle blowing act of CSE in alerting the nation to an issue with major implications to food safety, policy formulation, regulatory framework and human and environmental health.

ANNEXURE I

DETAILS OF THE SOFT DRINK SAMPLES PURCHASED BY CSE

S.No.	Name	Place of purchase	Date of purchase	Manufacturer	Date of manufacture	Expiry date	Batch Number	Other Information
1	2	3	4	5	6	7	8	9
1.	Pepsi-1	Mayur Vihar	22/5/03	Varun Beverages Ltd., Plot No. 159, RILCO Industrial Estate, Phase-III Boranada, Jodhpur-342001	9.5.03	Best before three months from manufacture.	PN-99	Pepsi is the registered Trademark of Pepsico. Inc.USA.
2.	Pepsi-2	Malviya Nagar	12/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	20/4/03	Best before three months from manufacture.	P.03.76.06:06	Pepsi is the registered Trademark of Pepsico. Inc.USA.
3.	Pepsi-3	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	2/4/03	Best before three months from manufacture.	P.03.54.01:50	Pepsi is the registered Trademark of Pepsico. Inc.USA.
4.	Mountain Dew-1	Meharchand Market	15/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	14/4/03	Best before three months from manufacture.	MO.03.19.10:00	Mountain Dew is the registered Trademark of Pepsico. Inc.USA.
5.	Mountain Dew-2	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	13/3/03	Best before three months from manufacture.	MO.03.13.15:09	Pepsi is the registered Trademark of Pepsico. Inc.USA.
6.	Mountain Dew-3	Malviya Nagar	12/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	28/4/03	Best before three months from manufacture.	MO.03.26.17:12	Pepsi is the registered Trademark of Pepsico. Inc.USA.
7.	Diet Pepsi-1	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	8/5/03	Best before two months from manufacture.	DP.03.11.13:21	Pepsi is the registered Trademark of Pepsico. Inc.USA.
8.	Diet Pepsi-2	Malviya Nagar	12/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	19/4/03	Best before two months from manufacture.	DP.03.9.14:25	Pepsi is the registered Trademark of Pepsico. Inc.USA.
9.	Diet Pepsi-3	Jor-Bagh Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	8/5/03	Best before two months from manufacture.	DP.03.11.18:21	Pepsi is the registered Trademark of Pepsico. Inc.USA.
10.	Mirinda Orange flavour-1	Malviya Nagar	12/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	22/4/03	Best before three months from manufacture.	MO.03.24.22:08	Mirinda is the registered Trademark of Pepsico. Inc.USA.
11.	Mirinda Orange flavour-2	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	2/5/03	Best before three months from manufacture.	MO.03.27.15:22	Mirinda is the registered Trademark of Pepsico. Inc.USA.
12.	Mirinda Orange flavour-3	Mayur Vihar	22/5/03	Varun Beverages Ltd., Dautana, Chatta, Distt. Mathura-282401	5/5/03	Best before three months from manufacture.	L3	Mirinda is the registered Trademark of Pepsico. Inc.USA.
13.	Mirinda lemon flavour-1	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	30/4/03	Best before three months from manufacture.	ML.03.9.21:21	Mirinda is the registered Trademark of Pepsico. Inc.USA.
14.	Mirinda lemon flavour-2	Malviya Nagar	12/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	5/4/03	Best before three months from manufacture.	ML.03.07.15:23	Mirinda is the registered Trademark of Pepsico. Inc.USA.
15.	Mirinda lemon flavour-3	Meharchand Market	17/6/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	30/5/03	Best before three months from manufacture.	ML.03.13.17:43	Mirinda is the registered Trademark of Pepsico. Inc.USA.
16.	Blue Pepsi-1	Prithvi Raj Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	13/4/03	Best before three months from manufacture.	PB.03.19.13:57	Pepsi is the registered Trademark of Pepsico. Inc.USA.
17.	Blue Pepsi-2	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	2/4/03	Best before three months from manufacture.	PB.03.18.21:20	Pepsi is the registered Trademark of Pepsico. Inc.USA.

1	2	3	4	5	6	7	8	9
18.	Blue Pepsi-3	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	13/4/03	Best before three months from manufacture.	PB.03.19.21:28	Pepsi is the registered Trademark of PepsiCo. Inc.USA.
19.	7-up-1	Prithvi Raj Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	15/3/03	Best before three months from manufacture.	S.03.02.19.06	7-up is the registered Trademark of PepsiCo. Inc.USA.
20.	7-up-2	INA Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	16/3/03	Best before three months from manufacture.	S.03.02.00.43	7-up is the registered Trademark of PepsiCo. Inc.USA.
21.	7-up-3	Khan Market	14/5/03	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur-302018	15/3/03	Best before three months from manufacture.	S.03.02.20.24	7-up is the registered Trademark of PepsiCo. Inc.USA.
22.	Coca Cola-1	Malviya Nagar	12/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	24/4/03	Best before two months from manufacture.	BN 724	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
23.	Coca Cola-2	INA Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	5/4/03	Best before two months from manufacture.	BN 512	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
24.	Coca Cola-3	INA Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	26/4/03	Best before two months from manufacture.	BN 738	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
25.	Fanta-1	INA Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	30/4/03	Best before 1.5 months from the date of manufacture.	BN 780	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
26.	Fanta-2	Jor Bagh Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	29/4/03	Best before 1.5 months from the date of manufacture.	BN 776	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
27.	Fanta-3	Malviya Nagar	12/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	8/4/03	Best before 1.5 months from the date of manufacture.	BN 537	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
28.	Limca-1	Meharchand Market	15/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	27/4/03	Best before two months from manufacture.	BN 747	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
29.	Limca-2	Malviya Nagar	12/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	27/4/03	Best before two months from manufacture.	BN 757	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
30.	Limca-3	INA Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	27/4/03	Best before two months from manufacture.	BN 753	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
31.	Sprite-1	Mayur Vihar	12/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	30/4/03	Best before two months from manufacture.	BN 787	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
32.	Sprite-2	INA Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	1/5/03	Best before two months from manufacture.	BN 796	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
33.	Sprite-3	Malviya Nagar	12/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	1/5/03	Best before two months from manufacture.	BN 791	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
34.	Thums up-1	INA Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	24/4/03	Best before two months from date of manufacture.	BN 720	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
35.	Thums up-2	Jor Bagh Market	14/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	24/4/03	Best before two months from date of manufacture.	BN 727	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA
36.	Thums up-3	INA Market	21/5/03	Hindustan Coca-Cola Beverages Pvt. Ltd., Tehsil-Hapur, District-Ghaziabad, UP	7/4/03	Best before two months from date of manufacture.	BN 525	For and behalf of Coca-Cola Company, Coca-Cola Plaza, Atlanta GA 30313, USA

Note: 1: All the samples purchased from Delhi were sealed in plastic bottles of 500 ml capacity.

DETAILS OF THE SOFT DRINK SAMPLES PURCHASED FROM USA
AND ANALYSED FOR PESTICIDE RESIDUES.

S.No.	Name	Place of purchase	Date of purchase	Manufacturer	Date of manufacture	Expiry date	Batch Number	Other Information
1.	Coca Cola	USA-Longs Drug Store, 1451 Shattuck Ave Berkeley CA 94709, USA	27/6/2003	Bottled under the authority of the Coca-Cola Company by a member of the CCE bottling group Atlanta, Georgia-30339	—	SEP0103	UYF09305	—
2.	Pepsi	USA Longs Drug Store 1451 Shattuck Ave Berkeley CA 97709, USA	27/6/2004	Manufactured by local bottlers for the Pepsi bottling group Inc. Somers N. Y 10589, under the authority of PepsiCo. Inc.	—	Jul2103	17320 A041331	—

ANNEXURE II

ORGANOCHLORINE PESTICIDE RESIDUES IN SOFT DRINK SAMPLES TESTED BY CSE

Sl.No.	Brands	Batch No.	Residues (mg/L)											
			α -HCH	β HCH	β HCH	Average of brands— Lindane	β HCH	DDT	DDE	DDD	Total DDT+ Metabo- lites	Average of brands— DDT+ Metab- olites	Total Organo- chlorines	Average of brands— Total Organochl- orines
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Pepsi-1	PN-99	ND	ND	0.0015	0.0015	ND	ND	0.0017	ND	0.0017	0.0016	0.0032	0.0032
2.	Pepsi-2	P.03.76.06:06	ND	ND	0.0016		ND	ND	0.0012	ND	0.0012		0.0028	
3.	Pepsi-3	P.03.54.01:50	ND	0.0003	0.0014		ND	ND	0.0018	ND	0.0018		0.0035	
4.	Mountain Dew-1	MO.03.19.10:00	ND	ND	0.0028	0.0025	ND	ND	0.0010	ND	0.0010	0.0008	0.0038	0.0033
5.	Mountain Dew-2	MO.03.13.15:02	ND	0.0001	0.0019		ND	ND	0.0006	ND	0.0006		0.0026	
6.	Mountain Dew-3	MO.03.26.17:12	ND	ND	0.0027		ND	ND	0.0008	ND	0.0008		0.0035	
7.	Diet Pepsi-1	OP.03.11.18:21	ND	ND	0.0007	0.0008	ND	ND	ND	ND	ND	ND	0.0007	0.0008
8.	Diet Pepsi-2	OP.09.9.14:25	ND	ND	0.0009		ND	ND	ND	ND	ND		0.0009	
9.	Diet Pepsi-3	OP.03.11.20:21	ND	ND	0.0008		ND	ND	ND	ND	ND		0.0008	
10.	Mirinda orange-1	MO.03.24.22:08	ND	ND	0.0030	0.0031	ND	0.0019	ND	ND	0.0019	0.0019	0.0049	0.0050
11.	Mirinda orange-2	MO.03.27.15:22	ND	ND	0.0032		ND	0.0020	ND	ND	0.0020		0.0052	
12.	Mirinda orange-3	L3	ND	ND	0.0031		ND	0.0018	ND	ND	0.0018		0.0049	
13.	Mirinda lemon-1	ML.03.9.21:21	ND	ND	0.0044	0.0042	ND	0.0039	ND	ND	0.0039	0.0042	0.0083	0.0084
14.	Mirinda lemon-2	ML.03.07.15:23	ND	ND	0.0036		ND	0.0052	ND	ND	0.0052		0.0088	
15.	Mirinda lemon-3	ML.03.13.17:43	ND	ND	0.0046		ND	0.0035	ND	ND	0.0035		0.0081	
16.	Blue Pepsi-1	PB.03.19.13:57	ND	ND	0.0010	0.0018	0.001	ND	ND	ND	ND	0.0001	0.0020	0.0022
17.	Blue Pepsi-2	PB.03.18.21:20	ND	ND	0.0020		ND	ND	0.0003	ND	0.0003		0.0023	
18.	Blue Pepsi-3	PB.03.19.21:28	ND	ND	0.0024		ND	ND	ND	ND	ND		0.0024	
19.	7-Up-1	S.03.02.19:06	ND	ND	0.0022	0.0020	ND	ND	0.0012	ND	0.0012	0.0013	0.0034	0.0036
20.	7-Up-2	S.03.02.00:43	ND	0.001	0.0013		ND	ND	0.0007	ND	0.0007		0.0030	
21.	7-Up-3	S.03.02.20:24	ND	ND	0.0025		ND	0.0006	0.0013	ND	0.0019		0.0044	
22.	Coca Cola-1	BN 724	ND	ND	0.0033	0.0035	ND	ND	0.0001	0.0006	0.0007	0.0009	0.0040	0.0044

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
23.	Coca Cola-2	BN 512	ND	ND	0.0038		ND	ND	ND	ND	ND			0.0038
24.	Coca Cola-3	BN 738	ND	ND	0.0034		ND	ND	0.0004	0.0017	0.0021			0.0055
25.	Fanta-1	BN 780	ND	0.0003	0.0013	0.0015	0.002	0.0020	0.0011	ND	0.0031	0.0033	0.0067	0.0060
26.	Fanta-2	BN 776	ND	ND	0.0018		ND	0.0034	0.0005	ND	0.0039			0.0057
27.	Fanta-3	BN 537	ND	0.001	0.0015		ND	0.0026	0.0004	ND	0.0030			0.0055
28.	Limca-1	BN 747	ND	0.0001	0.0016	0.0017	ND	0.0028	ND	ND	0.0028	0.0030	0.0045	0.0047
29.	Limca-2	BN 757	ND	ND	0.0019		ND	0.0030	ND	ND	0.0030			0.0049
30.	Limca-3	BN 753	ND	ND	0.0017		ND	0.0031	ND	ND	0.0031			0.0048
31.	Sprite-1	BN 787	ND	0.00074	0.0008	0.0014	ND	ND	0.0013	ND	0.0013	0.0009	0.0028	0.0027
32.	Sprite-2	BN 796	ND	ND	0.0012		ND	ND	0.0014	ND	0.0014			0.0026
33.	Sprite-3	BN 791	ND	0.0003	0.0023		ND	ND	ND	ND	ND			0.0026
34.	Thums up-1	BN 720	ND	0.00053	0.0011	0.0011	ND	ND	0.0002	ND	0.0002	0.0002	0.0019	0.0015
35.	Thums up-2	BN 727	ND	ND	0.0012		ND	ND	0.0003	ND	0.0003			0.0015
36.	Thums up-3	BN 525	ND	ND	0.0009		ND	ND	0.0003	ND	0.0003			0.0012
	Number of samples in which pesticides identified		0	9	36		2	13	20	2	29			36
	% of total samples in which pesticide residues identified		0	25	100		6	36	56	6	81			100
	EEC limit (mg/l)		0.0001	0.0001	0.0001		0.0001	0.0001	0.0001	0.0001	0.0001			
	Average		0	0.0001	0.0021	0.0021	0.0001	0.0010	0.0005	0.0001	0.0015	0.0015	0.0038	0.0038
	Deviation of average value from EEC limit		Within norms	1	21	21	1	10	5	1	2			
	Minimum Amount		0	0.0000	0.0007	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0007	
	Deviation of minimum value from EEC limit		Within norms	Within norms	7	8	Within norms	Within norms	Within norms	Within norms	Within norms	1		
	Maximum Amount		0	0.0010	0.0046	0.0042	0.0020	0.0052	0.0018	0.0017	0.0052	0.0042	0.0088	
	Deviation of maximum value from EEC limit		Within norms			42						42		

Note: 1. Average of triplicate.

2. ND—Not detected.

3. α -endosulfan β -endosulfan and endosulfan sulfate, heptachlor, aldrin, Chlordane, dieldrin, methoxychlor and synthetic pyrethroides-permethrin cypermethrin, fenvalerate and deltamethrin were also analysed and were not detected.

ANNEXURE III

ORGANOPHOSPHORUS PESTICIDE RESIDUES IN
SOFT DRINK SAMPLES TESTED BY CSE

Sl.No.	Brands	Batch No.	Residues (mg/L)					
			Chlorpyrifos	Average of brands— Chlorpyrifos	Malathion	Average of brands— Malathion	Total organophosphorus	Average of brands—Total Organophosphorus
1	2	3	4	5	6	7	8	9
1.	Pepsi-1	PN-99	0.0054	0.0062	0.0123	0.0093	0.0177	0.0155
2.	Pepsi-2	P.03.76.06:06	0.0070		0.0072		0.0142	
3.	Pepsi-3	P.03.54.01:50	0.0063		0.0083		0.0146	
4.	Mountain Dew-1	MO.03.19.10:00	0.0036	0.0038	0.0060	0.0069	0.0096	0.0108
5.	Mountain Dew-2	MO.03.13.15:02	0.0016		0.0051		0.0067	
6.	Mountain Dew-3	MO.03.26.17:12	0.0063		0.0097		0.0160	
7.	Diet Pepsi-1	OP.03.11.18:21	0.0039	0.0032	0.0036	0.0031	0.0075	0.0063
8.	Diet Pepsi-2	OP.09.9.14:25	0.0027		0.0020		0.0047	
9.	Diet Pepsi-3	OP.03.11.20:21	0.0029		0.0037		0.0066	
10.	Mirinda orange-1	MO.03.24.22:08	0.0069	0.0055	0.0128	0.0091	0.0197	0.0146
11.	Mirinda orange-2	MO.03.27.15:22	0.0046		0.0056		0.0102	
12.	Mirinda orange-3	L3	0.0050		0.0090		0.0140	
13.	Mirinda lemon-1	ML.03.9.21:21	0.0082	0.0072	0.0208	0.0196	0.0290	0.0268
14.	Mirinda lemon-2	ML.03.07.15:23	0.0059		0.0164		0.0223	
15.	Mirinda lemon-3	ML.03.13.17:43	0.0076		0.0215		0.0291	
16.	Blue Pepsi-1	PB.03.19.13:57	0.0034	0.0050	0.0063	0.0075	0.0097	0.0125
17.	Blue Pepsi-2	PB.03.18.21:20	0.0074		0.0090		0.0164	
18.	Blue Pepsi-3	PB.03.19.21:28	0.0042		0.0072		0.0114	
19.	7-Up-1	S.03.02.19:06	0.0024	0.0025	0.0105	0.0104	0.0129	0.0130
20.	7-Up-2	S.03.02.00:43	0.0030		0.0118		0.0148	
21.	7-Up-3	S.03.02.20:24	0.0022		0.0090		0.0112	

1	2	3	4	5	6	7	8	9
22.	Coca Cola-1	BN 724	0.0043	0.0042	0.0140	0.0137	0.0183	0.0179
23.	Coca Cola-2	BN 512	0.0045		0.0091		0.0136	
24.	Coca Cola-3	BN 738	0.0038		0.0180		0.0218	
25.	Fanta-1	BN 780	0.0066	0.0061	0.0170	0.0093	0.0236	0.0154
26.	Fanta-2	BN 776	0.0068		0.0062		0.0130	
27.	Fanta-3	BN 537	0.0050		0.0047		0.0097	
28.	Limca-1	BN 747	0.0029	0.0030	0.0068	0.0071	0.0097	0.0101
29.	Limca-2	BN 757	0.0035		0.0073		0.0108	
30.	Limca-3	BN 753	0.0026		0.0072		0.0098	
31.	Sprite-1	BN 787	0.0016	0.0015	0.0000	0.0013	0.0016	0.0028
32.	Sprite-2	BN 796	0.0010		0.0015		0.0025	
33.	Sprite-3	BN 791	0.0020		0.0024		0.0044	
34.	Thums up-1	BN 720	0.0024	0.0024	0.0067	0.0073	0.0091	0.0096
35.	Thums up-2	BN 727	0.0021		0.0071		0.0092	
36.	Thums up-3	BN 525	0.0026		0.0080		0.0106	
	Number of samples in which pesticides identified		36		35			
	% of total samples in which pesticide residues identified		100		97			
	EEC limit (mg/l)		0.0001		0.0001		0.0001	
	Average		0.0042	0.0042	0.0087	0.0087	0.0129	
	Deviation of average value from EEC limit		42	42.0000	87			
	Minimum Amount		0.0010	0.0015	0.0000	0.0013	0.0016	
	Deviation of minimum value from EEC limit		10	15	Within norms	13		
	Maximum Amount		0.0082	0.0072	0.0215	0.0196	0.0291	
	Deviation of maximum value from EEC limit			72		196		

Note: 1. Average of triplicate.
2. ND—Not detected.
3. Dichlorvos, diazinon, monocrotofos, phosphamidon, malaoxon, methyl-parathion, quinalphos, phenthoate, profenofos and ethion were also analysed and were not detected.

DETAILS OF SAMPLES RECEIVED BY CFL (CFTRI), MYSORE

Number of samples received : 12 Nos. (2 x 500 ml each)
Received Date : 09.08.2003

Sl.No.	Name of the Product	Name of the manufacturer	Date of manufacture	Best Before Date	Batch No.
1	2	3	4	5	6
1.	Limca	Coca Cola Beverages Pvt. Ltd., Tehsil Hapur, Dist. Ghaziabad	11.07.03	2 Months from the date of manufacture	1649
2.	Diet Pepsi	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur	28.07.03	2 Months from the date of manufacture	OP.03.17
3.	Pepsi	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur	09.07.03	3 Months from the date of manufacture	P.03.164
4.	7Up	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur	20.06.03	3 Months from the date of manufacture	No. S.03.12
5.	Fanta	Bottled by Hindustan Coca Cola Beverages Pvt. Ltd., Tehsil Hapur, Ghaziabad	12.06.03	1.5 Months from the date of manufacture	B.N. 1373
6.	Mirinda (Lemon Flavour)	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur	30.05.03	3 Months from the date of manufacture	ML.03.13
7.	Mountain Dew	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur	10.07.03	3 Months from the date of manufacture	MD 03.33
8.	Thums Up	Bottled by Hindustan Coca Cola Beverages Pvt. Ltd., Tehsil Hapur, Ghaziabad	04.06.03	1.5 Months from the date of manufacture	1276
9.	Coca Cola	Bottled by Hindustan Coca Cola Beverages Pvt. Ltd., Tehsil Hapur, Ghaziabad	18.07.03	2 Months from the date of manufacture	1677

1	2	3	4	5	6
10.	Mirinda (Orange Flavour)	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur	22.07.03	3 Months from the date of manufacture	MO.03.56
11.	Sprite	Bottled by Hindustan Coca Cola Beverages Pvt. Ltd., Tehsil Hapur, Ghaziabad	29.05.03	2 Months from the date of manufacture	1195
12.	Blue Pepsi	Jai Drinks Pvt. Ltd., Jawahar Lal Nehru Marg, Jaipur	02.04.03 16.03.03	3 Months from the date of manufacture	PB.03.18 PB.03.17

ANNEXURE V

ORGANOCHLORINE PESTICIDE RESIDUES IN SOFT DRINKS (MG/L)
DETECTED BY CFTRI, MYSORE

Sl. No.	Brand Name	α -HCH	β -HCH	γ -HCH	δ -HCH	Total HCH	DDT	DDE	DDD	Total DDT+ Metabolites	Total Organo-chlorines (OC)
1.	Limca	ND	ND	0.000009	ND	0.000009	ND	ND	ND	ND	0.000009
2.	Diet Pepsi	ND	ND	0.000046	ND	0.000046	0.00018 (1.8)	ND	ND	0.00018	0.000226
3.	Pepsi	ND	ND	0.000008	ND	0.000008	ND	ND	ND	ND	0.000008
4.	7Up	0.0001	ND	0.000094	ND	0.000194	ND	ND	ND	ND	0.000194
5.	Fanta	0.0002 (2)	ND	0.00013 (1.3)	ND	0.00033	ND	ND	ND	ND	0.00033
6.	Mirinda (Lemon Flavour)	0.0004 (4)	ND	0.00005	ND	0.00045	0.00022 (2.2)	0.00066 (6.6)	ND	0.00088	0.00133
7.	Mountain Dew	0.0003 (3)	ND	0.00009	ND	0.00039	ND	ND	ND	ND	0.00039
8.	Thums Up	0.0003 (3)	ND	0.00007	ND	0.00037	ND	0.00048 (4.8)	ND	0.00048	0.00085
9.	Coca Cola	0.0003 (3)	ND	0.00014 (1.4)	ND	0.00044	ND	0.00088 (8.8)	ND	0.00088	0.00132
10.	Mirinda (Orange Flavour)	0.0003 (3)	ND	0.00011 (1.1)	ND	0.00041	ND	0.0008 (8)	ND	0.0008	0.00121
11.	Sprite	0.0003 (3)	ND	0.00003	ND	0.00033	ND	0.0008 (8)	ND	0.0008	0.00113
12.	Blue Pepsi	0.0005 (5)	ND	0.00013 (1.3)	ND	0.00063	ND	0.00124 (12.4)	ND	0.00124	0.00187

ND = Not detected

Note : Figure given in the parenthesis indicates number folds higher than European Norms for Packaged Drinking Water (0.0001 mg/L for individual pesticides and 0.0005 mg/L for Total Pesticides)

Repeatability, Reproducibility and Trueness of the results as per the Alinorm 3/24 of Codex Alimentarius commission i.e. "Report of the 34th session of the Codex Committee on Pesticide Residues (The Hague, The Netherlands, 13—18 May-2002) as reported in the Joint FAO/WHO Food standard programme of CAC, 30th June-5th July, 2003.

ORGANOPHOSPHORUS PESTICIDE RESIDUES IN SOFT DRINKS (MG/L)
DETECTED BY CFTRI, MYSORE

Sl.No.	Brand Name	Chlorpyrifos	Malathion	Total Organophosphorus (OP)	Total OC+OP
1.	Limca	0.00002	ND	0.00002	0.000029
2.	Diet Pepsi	0.00004	ND	0.00004	0.000266
3.	Pepsi	0.000017	ND	0.000017	0.000025
4.	7Up	0.00039 (3.9)	ND	0.00039	0.000584 (1.6)
5.	Fanta	0.00054 (5.4)	ND	0.00054	0.00087 (1.74)
6.	Mirinda (Lemon Flavour)	0.00078 (7.8)	ND	0.00078	0.00211 (4.2)
7.	Mountain Dew	0.00061 (6.1)	ND	0.00061	0.00102 (2.0)
8.	Thums Up	0.00063 (6.3)	ND	0.00063	0.00100 (2.0)
9.	Coca Cola	0.00070 (7.0)	ND	0.00070	0.002 (4.0)
10.	Mirinda (Orange Flavour)	0.00050 (5.0)	ND	0.00050	0.00171 (3.4)
11.	Sprite	0.000498 (4.9)	ND	0.000498	0.001628 (3.2)
12.	Blue Pepsi	0.00076 (7.6)	ND	0.00076	0.00263 (5.2)

ND = Not detected

Note : Figure given in the parenthesis indicates number folds higher than European Norms for Packaged Drinking Water (0.0001 mg/L for individual pesticides and 0.0005 mg/L for Total Pesticides)

Repeatability, Reproducibility and Trueness of the results as per the Alinorm 3/24 of Codex Alimentarius commission *i.e.* "Report of the 34th session of the Codex Committee on Pesticide Residues (The Hague, The Netherlands, 13—18 May, 2002) as reported in the Joint FAO/WHO Food standard programme of CAC, 30th June—5th July, 2003.

DETAILS OF SAMPLES RECEIVED BY CFL, KOLKATA

Sl.No.	Name of the Product	Name of the manufacturer	Date of manufacture	Best Before Date	Batch No.
1.	Pepsi	Jai Drinks Pvt. Ltd., Jaipur	9.7.2003	3 months from date of manufacture	P.03.164
		Varun Beverages Ltd., Jodhpur	Samples not available		
2.	Diet Pepsi	Jai Drinks Pvt. Ltd., Jaipur	28.7.2003	2 months from date of manufacture	P.03.17
3.	Mountain Dew	Jai Drinks Pvt. Ltd., Jaipur	10.7.2003	3 months from date of manufacture	MD 03.33
4.	Mirinda Orange	Jai Drinks Pvt. Ltd., Jaipur	22.7.2003	3 months from date of manufacture	MD.03.50
		Varun Beverages Ltd., Mathura	Samples not available		
5.	Mirinda Lemon	Jai Drinks Pvt. Ltd., Jaipur	30.5.2003	3 months from date of manufacture	ML.03.13
6.	Blue Pepsi	Jai Drinks Pvt. Ltd., Jaipur	19.4.2003	3 months from date of manufacture	PB 03.19
7.	7 Up	Jai Drinks Pvt. Ltd., Jaipur	20.6.2003	3 months from date of manufacture	SO 3.12
8.	Coca Cola	Hindustan Cola Beverages Ltd., Ghaziabad	18.7.2003	2 months from date of manufacture	1677
9.	Fanta	Hindustan Cola Beverages Ltd., Ghaziabad	10.6.2003 9.6.2003	1.5 months from date of manufacture	1346 1338
10.	Limca	Hindustan Cola Beverages Ltd., Ghaziabad	11.7.2003	2 months from date of manufacture	1645
11.	Sprite	Hindustan Cola Beverages Ltd., Ghaziabad	29.5.2003	2 months from date of manufacture	1202
12.	Thums Up	Hindustan Cola Beverages Ltd., Ghaziabad	4.6.2003	1.5 months from date of manufacture	1276

ANNEXURE VIII

ORGANOCHLORINE PESTICIDE RESIDUES FOUND BY CFL, KOLKATA

Sl. No.	Brands	Batch No./ Mfg. Date	α -HCH mg/L	β -HCH mg/L	γ -HCH (Lindane) mg/L	δ -HCH mg/L	DDT mg/L	DDE mg/L	DDD mg/L	Total DDT + Metabolites mg/L	Total Organo-Chlorine mg/L
1.	Pepsi	P.03.164 09.07.03	ND	ND	ND	ND	0.00009	ND	ND	0.00009	0.00009
2.	Diet Pepsi	P.03.17 28.07.03	ND	ND	ND	ND	ND	ND	ND	ND	ND
3.	Mountain Dew	MD.03.33 10.07.03	ND	ND	0.00006	ND	0.00015	0.00008	ND	0.00023	0.00029
4.	Mirinda Orange	MD.03.50 22.07.03	ND	ND	0.00008	ND	0.001	0.00008	0.00025	0.00137	0.00141
5.	Mirinda Lemon	ML.03.13 30.05.03	ND	0.0001	0.0007	ND	0.0001	ND	0.00015	0.00025	0.00105
6.	Blue Pepsi	PB.03.19 19.04.03	ND	ND	ND	ND	0.0001	0.00012	ND	0.00022	0.00022
7.	7 Up	S.03.12 20.06.03	ND	ND	0.00005	0.00006	0.00006	0.00006	ND	0.00012	0.00023
8.	Coca Cola	1677 18.07.03	ND	ND	0.00007	0.00006	ND	0.00007	ND	0.00007	0.0002
9.	Fanta	1346 10.06.03	0.0001	ND	0.00017	ND	0.0002	ND	0.00024	0.00044	0.00071
10.	Limca	1645 11.07.03	ND	ND	0.00009	0.00007	0.00006	ND	ND	0.00006	0.00022
11.	Sprite	1202 29.05.03	ND	ND	0.00007	ND	ND	ND	ND	ND	0.00007
12.	Thums Up	1276 04.06.03	ND	0.0003	0.00006	ND	0.0001	0.00007	ND	0.00017	0.00053
Number of Samples in which Pesticides identified			1	2	9	3	9	6	3		
% of Total Samples in which Pesticides identified			8.33	16.67	75.00	25.00	75.00	50.00	25.00		

ND = Not Detected

ANNEXURE IX

ORGANOPHOSPHORUS PESTICIDE RESIDUES FOUND BY CFL, KOLKATA

Sl. No.	Brands	Batch No./ Mfg. Date	Chlorophyrifos mg/L	Malathion mg/L	Total Organophosphorus mg/L
1.	Pepsi	P.03.164 09.07.03	ND	ND	ND
2.	Diet Pepsi	P.03.17 28.07.03	0.00036	ND	0.00036
3.	Mountain Dew	MD.03.33 10.07.03	0.0009	ND	0.0009
4.	Mirinda Orange	MD.03.50 22.07.03	0.0012	ND	0.0012
5.	Mirinda Lemon	MI.03.13 30.05.03	0.00069	ND	0.00069
6.	Blue Pepsi	PB.03.19 19.04.03	ND	ND	ND
7.	7 Up	S.03.12 20.6.03	0.0001	ND	0.0001
8.	Coca Cola	1677 18.07.03	0.0004	ND	0.0004
9.	Fanta	1346 10.06.03	0.0011	ND	0.0011
10.	Limca	1645 11.07.03	0.0002	ND	0.0002
11.	Sprite	1202 29.05.03	0.00005	ND	0.00005
12.	Thums Up	1276 04.06.03	0.0001	ND	0.0001
Number of Samples in which Pesticides identified			10	0	
% of Total Samples in which Pesticides identified			83.33	0	

ND = Not Detected

COMPARISON OF METHODS FOR ORGANOCHLORINE AND
ORGANOPHOSPHORUS PESTICIDE RESIDUES

	EPA Method	CSE Method	CFTRI Method
	1	2	3
EXTRACTION	Method: 3510 Sample Quantity: 1L	Method: 3510 Sample Quantity: 500 ml	Method: 3510 Sample Quantity: 500 ml
CLEAN-UP TECHNIQUE	Method 3640 (Gel Permeation Chromatography) 3630 (Silica gel clean-up) and 3620 B (Florisil column cleanup) 1st Elute: 200ml Ethyl Ether/Hexane (6/94) 2nd Elute: 200ml Ethyl Ether/Hexane (15/85) 3rd Elute: 200ml Ethyl Ether/Hexane (50/50) 4th Elute: 200ml 100% Ethyl Ether	3620 B (Florisil column cleanup) 1st Elute: 100 ml Hexane 2nd Elute: 100ml 30% DCM in Hexane 3rd Elute: 100 DCM	3620 B (Florisil column cleanup) 1st Elute: 100ml Hexane 2nd Elute: 100ml 30% DCM in Hexane 3rd Elute: 100 VOml DCM
INSTRUMENT CONDITIONS			
COLUMN USED	DB-608/DB-5 and DB 1701 30m x 0.53 mm—ID Fused silica capillary column	COLUMN 1 DB-17 Capillary column 30m x 0.25 mm id x 0.25 µm film Column 2 DB-5 capillary column 30m x 0.25 mm id x 0.25 µm film	COLUMN 1 HP 50 + Capillary column 30m x0.25 mm id x 0.25 µm film Column 2 BPX-5 Capillary column 30m x 0.25 mm id x 0.25 µm film
OVEN			
COLUMN 1	DB-5 column for Organochlorine 140°C for 2 minute @2.8°C/min to 270°C, 1 min	For Organochlorine 120°C for 1 minute @25°C/min to 205°C for 1 minute @2° C/Min to 290°C for 12 minutes For Organophosphorus 120°C for 1 minute @25°C/min to 205°C for 1 minute @2°C/min to 290°C for 1 minute	For Organochlorine and Organophosphorus 180°C for 25 minutes 2°C/min to 210°C for 10 minutes

	1	2	3
COLUMN 2	For Organophosphorus 120°C for 3 minutes @5°C/min to 270°C for 10 minutes	Not available	For Organochlorine and Organophosphorus 150°C for 12 minutes 2°C/min to 200°C for 15 minutes
Injector	250°C	Splitless, 270°C for both OC & OP	Splitless, 220°C for both OC & OP
Detector	ECD 320°C	ECD 320°C, NPD 300°C	ECD 250°C
Carrier	He & N ₂ , 6 ml/min	N ₂ : 0.4ml/min for organochlorine 1.3ml/min for organophosphorus	N ₂ : 1 ml/min for column 1 & 0.8 ml/min for column 2

RESULTS OF PESTICIDES ANALYSIS IN SOFT DRINKS BY
CENTRAL POLLUTION CONTROL BOARD

(Concentrations in $\mu\text{g/L}$)
Organochlorine Pesticides
(Varian Star 3400_{CX}GC with ECD)

Organochlorine Pesticide	Coca Cola	Pepsi	Limca	Sprite	Mountain Dew	Mirinda Orange
α -BHC	0.020	0.040	0.052	0.037	0.171	0.060
β -BHC	0.096	0.426	0.226	0.142	0.064	BDL
γ -BHC (Lindane)	BDL	0.148	BDL	BDL	BDL	BDL
Aldrin	BDL	BDL	0.084	BDL	0.013	0.018
α -Endosulphan	BDL	BDL	0.151	BDL	0.020	0.767
Dieldrin	0.024	0.033	0.073	0.010	0.065	0.076
p,p' -DDE	0.238	0.079	1.496	0.034	0.515	0.234
β -Endosulphan	BDL	0.098	0.255	BDL	0.081	0.112
o,p -DDT	0.067	BDL	BDL	0.025	0.576	0.424
p,p' -DDT	BDL	0.074	0.468	BDL	BDL	BDL
Total Organochlorine Pesticides Residue	0.445	0.898	2.805	0.249	1.505	1.690

Organophosphorus Pesticides
(Agilent 6890 plus Series GC with 5973 Network MSD)

Organophosphorus Pesticides	Coca Cola	Pepsi	Limca	Sprite	Mountain Dew	Mirinda Orange
Malathion	0.017	0.354	0.438	0.020	0.362	0.187
Chlorpyrifos	0.029	0.278	0.378	0.056	0.955	0.180
Total Organophosphorus Pesticides Residue	0.046	0.632	0.816	0.075	1.317	0.367
Total Pesticides Residue	0.491	1.531	3.621	0.324	2.822	2.057
Number of Times exceeding EU Standard	—	3.1	7.2	—	5.6	4.1

European Standard for Individual Pesticide in Drinking Water : 0.100 $\mu\text{g/L}$

European Standard for Total Pesticides in Drinking Water : 0.500 $\mu\text{g/L}$

BDL = Below Detection Limit

A UNIT OF SHRIRAM SCIENTIFIC & INDUSTRIAL RESEARCH FOUNDATION
BANGALORE—560 048
Telegram: SHRILAB. Telephone: 841015, 8410175

TEST CERTIFICATE NO. BG/30659

DOR: 03-10-03	Reg. No.	310-101-0012
DOS: 03-10-03	Date	28-10-2003
DOC 20-10-03	Your Ref. No.	AFB/71421/2003/Dated 01-10-2003.

To

Directorate of Health Service
Thiruvananthapuram
Kerala

Attn. Dr. V.K. Rajan
Director of Health Service

Sample Particulars: One sample of PEPSI informal sample No. IPS No. 6/03-04 Batch No. 275, D/M 30/4/2003, Date of Drawing 26/9/2003, Place: Kazhakuttam was received.

Sl. No.	Tests	Results	Detection Limit	Protocol
I. Residual Pesticides				
1.	Gama-SHC Lindane-3, ppb	1.0	—	AOAC Chap. 10/BC-MS
2.	P.P.-DDT, ppb	BDL	0.1	AOAC Chap. 10/GC-MS
3.	Ethyl parathion, ppb	BDL	0.1	AOAC Chap. 10/BC-MS
4.	Malathion, ppb	0.7	—	AOAC Chap. 10/BC-MS
5.	Carbofuran, ppb	BDL	0.1	AOAC Chap. 10/BC-MS
6.	Carbaryl, ppb	BDL	0.1	AOAC Chap. 10/BC-MS
II. Heavy Metalas 1				
1.	Lead (an pb) ppm	BDL	0.1	AOAC/AAB
2.	Cadmium (an Cd) ppm	BDL	0.1	AOAC/AAB

Note: BDL Denotes below detection limit

Authorised Signatory
Scientist

A UNIT OF SHRIRAM SCIENTIFIC & INDUSTRIAL RESEARCH FOUNDATION

BANGALORE—560 048

Telegram: SHRILAB. Telephone: 841015, 8410175

TEST CERTIFICATE NO. BG/30660

DOR: 03-10-03 Reg. No. 310-101-0013
DOS: 03-10-03 Date 28-10-2003
DOC: 20-10-03 Your Ref. No. AFB/71421/2003/Dated 01-10-2003.

To

Directorate of Health Service
Thiruvananthapuram
Kerala

Attn. Dr. V.K. Rajan
Director of Health Service

Sample Particulars: One sample of COLA informal sample No. IPS No. 6/03-04 Batch No. 275, D/M 30/4/2003, Date of Drawing 26/9/2003, Place: Kazhakuttam was received.

Sl. No.	Tests	Results	Detection Limit	Protocol
I. Residual Pesticides				
1.	Gama-SHC Lindane-3, ppb	32.0	—	AOAC Chap. 10/BC-MS
2.	P.P.-DDT, ppb	0.4	—	AOAC Chap. 10/BC-MS
3.	Ethyl parathion, ppb	BDL	0.1	AOAC Chap. 10/BC-MS
4.	Malathion, ppb	9.9	—	AOAC Chap. 10/GC-MS
5.	Carbofuran, ppb	BDL	0.1	AOAC Chap. 10/BC-MS
6.	Carbaryl, ppb	BDL	0.1	AOAC Chap. 10/BC-MS
II. Heavy Metalas 1				
1.	Lead (an pb) ppm	BDL	0.1	AOAC/AAB
2.	Cadmium (an Cd) ppm	BDL	0.1	AOAC/AAB

Note: BDL Denotes below detection limit

Authorised Signatory
Scientist

COMPARISON OF THE RESULTS OF CFL (CFTRI), MYSORE AND
CSE, NEW DELHI AND CFL, KOLKATA

Sl.No.	Brand	CFL (CFTRI), Mysore		CSE, New Delhi		CFL, Kolkata	
		Total Pesticide Residues OC+OP (mg/L)	No. of folds higher than EEC Limits	Total Pesticide Residues OC+OP (mg/L)	No. of folds higher than EEC Limits	Total pesticides	Higher than EEC
1.	Limca	0.000029	Below EEC limits	0.0148	30	0.00042	Within limit
2.	Diet Pepsi	0.000266	Below EEC limits	0.0071	14	0.00036	Within limit
3.	Pepsi	0.000025	Below EEC limits	0.0187	37	0.00009	Within limit
4.	7 Up	0.000584	1.6	0.0166	33	0.00033	Within limit
5.	Fanta	0.000087	1.7	0.0214	43	0.00181	3.62
6.	Mirinda (Lemon Flavour)	0.000211	4.2	0.0352	70	0.00174	3.48
7.	Mountain Dew	0.00102	2.0	0.0141	28	0.00119	2.38
8.	Thums Up	0.00100	2.0	0.0111	22	0.00063	1.26
9.	Coca Cola	0.002	4.0	0.0223	45	0.0006	1.2
10.	Mirinda (Orange flavour)	0.00171	3.4	0.0196	39	0.00261	5.22
11.	Sprite	0.001628	3.2	0.0055	11	0.00012	Within limit
12.	Blue Pepsi	0.00263	5.2	0.0147	29	0.00022	Within limit

EEC limit for total pesticide residues: 0.0005 mg/L.

PRESENCE OF PESTICIDES AS A COMMON SCIENTIFIC FINDING

Sl.No.	Pesticide	CSE New Delhi	CFL CFTRI, Mysore	CFL Kolkata
1	2	3	4	5
1.	DDT	√	√	√
2.	BHC	√	√	√
3.	Chlorpyriphos	√	√	√
4.	Lindane (Y-BHC)	√	√	√
5.	Malathion	√	ND	ND
6.	Parathion	ND	ND	ND
7.	Fcnitrothion	ND	ND	ND
8.	Carbaryl	ND	ND	ND
9.	Aldicarb	ND	ND	ND
10.	Methyl Parathion	ND	ND	ND
11.	Carbofuran	ND	ND	ND
12.	Dimethoate	ND	ND	ND
13.	Phosalone	ND	ND	ND
14.	Monocrotophos	ND	ND	ND
15.	Ethion	ND	ND	ND
16.	Dichlorvos	ND	ND	ND
17.	Propoxur	ND	ND	ND
18.	Diazinon	ND	ND	ND
19.	Fenthion	ND	ND	ND
20.	Phosphamidon	ND	ND	ND
21.	Endosulfan	ND	ND	ND
22.	Cypermethrin	ND	ND	ND
23.	Deltamethrin	ND	ND	ND

1	2	3	4	5
24.	Fenvalcrate	ND	ND	ND
25.	Permethrin	ND	ND	ND
26.	Altrazinc	ND	ND	ND
27.	Simazinc	ND	ND	ND
28.	Captafol	ND	ND	ND
29.	Accphatc	ND	ND	ND
30.	Dithiocarbamate	ND	ND	ND
31.	Metalaxyl	ND	ND	ND
32.	Fosetyl Aluminium	ND	ND	ND

ND—Not Detected.

√-Detected

DDT includes its metabolitics.

BHC includes its isomers.

22, 23, 24 and 25 are the synthetic pyrethroids.