



Apron

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Method no: PV2102

Target Concentration: 5 mg/m<sup>3</sup> (arbitrary).  
There is no OSHA PEL or ACGIH TLV for Apron.

Procedure: Samples are collected by drawing 60 L of air through glass fiber filters. Samples are extracted with acetonitrile and analyzed by high performance liquid chromatography (HPLC).

Recommended air volume and sampling rate: 60 minutes at 1 L/min (60 Liters)

Detection limit of the overall procedure based on the recommended air volume: 0.02 mg/m<sup>3</sup>

Status of method: Partially validated method. This method has been only partially evaluated and is presented for information and trial use.

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## 1 General discussion

### 1.1 Background

The OSHA Analytical Laboratory received a set of samples for which an analysis of Apron was requested. The air samples had been collected on glass fiber filters at a flow rate of 1 L/min. This report describes the analytical method developed for Apron and a preliminary validation of glass fiber filter as the sampling medium.

### 1.2 Toxic effects (This section is for information only and should not be taken as the basis of OSHA policy.)

The oral LD<sub>50</sub> of Apron is 669 mg/kg in rats. The acute dermal LD<sub>50</sub> is >3100 mg/kg for rats. It is relatively non-toxic to fish and wildlife. (Ref. 5.1)

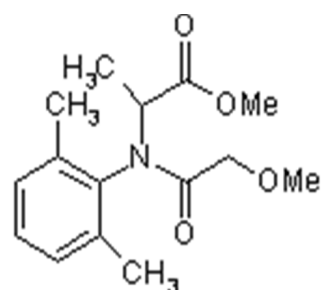
### 1.3 Potential workplace exposure (Ref. 5.3)

Apron is used as a fungicide in agricultural applications. No estimate of worker exposure during its production, formulation, and use as a fungicide could be found.

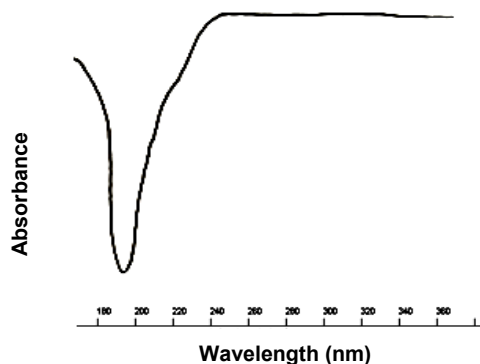
### 1.4 Physical properties (Ref. 5.1 and 5.2)

CAS no: 57837-19-1  
Chemical name: N-(2,6-Dimethylphenyl)-N-(methoxyacetyl) -DL-alanine methyl ester  
Synonym: Apron 2E; CG 117; CGA 48988; Metalaxil; Ridomil; Ridomil 2E; Subdue; Subdue 2E; Subdue 5SP; N-(Methoxyacetyl)-N-(2,6-xyllyl)-DL-alanine methyl ester  
Molecular formula: C<sub>15</sub>H<sub>21</sub>NO<sub>4</sub>  
Molecular weight: 279.37  
Appearance: White crystals  
Melting point: 71-72 °C  
Vapor pressure: 2.2 × 10<sup>-6</sup> mmHg at 20 °C  
Solubility: Solubility in water at 20 °C is 7.1 g/L.  
Apron is readily soluble in most organic solvents.

Structure:



UV Scan:



1.5 Detection limit of the analytical procedure

The detection limit of the analytical procedure is 4.3 ng per injection.

2 Sampling procedure

2.1 Apparatus and reagents

2.1.1 A personal sampling pump that can be calibrated to within  $\pm 5\%$  of the recommended flow rate.

2.1.2 Glass fiber filter, 37-mm diameter, Gelman Type A, or equivalent.

2.1.3 Filter holder for 37-mm filters, Millipore M000037A0, or equivalent.

2.2 Sampling procedure

Use standard air sampling technique as specified in OSHA Instruction CPL 2-2.20A, Chapter II: Standard Methods for Sampling Air Contaminants.

2.3 Recommended air volume and sampling rate

2.3.1 The recommended air volume is 60 L.

2.3.2 The recommended sampling rate is 1 L/min.

2.4 Extraction efficiency

Three glass fiber filters were each spiked with  $\sim 16.35 \mu\text{g}$  of Apron. The filters were extracted with 5.0 mL of acetonitrile and analyzed. The average recovery of Apron was 100.4%.

Apron Extraction Efficiency		
YC1	16.07 $\mu\text{g}$	98.3%
YC2	16.60 $\mu\text{g}$	101.5%
YC3	16.56 $\mu\text{g}$	101.3%
average = 100.4%		

2.5 Retention efficiency

Three glass fiber filters were each spiked with  $\sim 16.35 \mu\text{g}$  of Apron. Humid air (50% RH, 183 L @ 1 L/min) was drawn through the filters. The filters were extracted with 5.0 mL of acetonitrile and analyzed. The average recovery of Apron was 97.9%.

Apron Retention Efficiency		
YC7	15.46 $\mu\text{g}$	94.6%
YC8	16.40 $\mu\text{g}$	100.3%
YC9	16.13 $\mu\text{g}$	98.7%
average = 97.9%		

## 2.6 Storage

Three glass fiber filters were each spiked with ~17.05 µg of Apron. Humid air (50% RH, 183 min @ 1 L/min) was drawn through the filters. The filters were stored at room temperature for 5 days, extracted with acetonitrile, and analyzed. The average recovery of Apron was 104.9%.

YC10	17.05 µg	104.3%
YC11	17.05 µg	104.3%
YC12	17.33 µg	106.0^
average = 104.9%		

## 2.7 Interferences

There are no known interferences to the sampling procedure.

## 3 Analytical method

### 3.1 Apparatus

- 3.1.1 High performance liquid chromatograph.
- 3.1.2 Alltech C18 column or equivalent.
- 3.1.3 UV detector.
- 3.1.4 Strip chart recorder.

### 3.2 Reagents

- 3.2.1 Water, HPLC grade.
- 3.2.2 Acetonitrile, HPLC grade.
- 3.2.3 Apron (Ridomil), EPA standard # F701.

### 3.3 Standard preparation

Weigh 2 to 4 mg of Apron in a 10-mL volumetric flask. Add acetonitrile to the mark. Dilute standards with acetonitrile to a suitable working range.

### 3.4 Sample preparation

Samples were extracted with 5.0 mL of acetonitrile and 30 minutes on a mechanical shaker.

### 3.5 Analysis

#### 3.5.1 Instrument conditions

Column: Alltech C18  
Mobile phase: 60% acetonitrile/40% water  
Detector: 198 nm (primary), 214 nm  
Flow rate: 1.0 mL/min  
Injection size: 25 µL  
Retention time: 7.0 min

### 3.5.2 Chromatogram

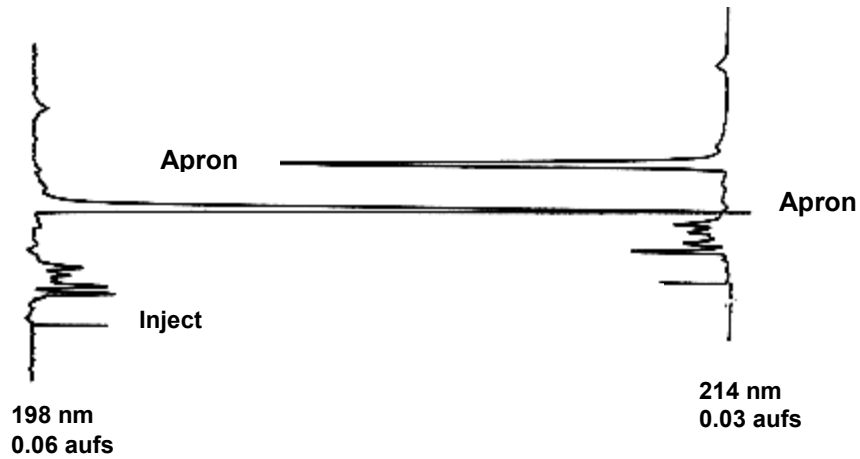


Figure 1. HPLC Chromatogram of Apron.

### 3.6 Interferences

- 3.6.1 Any collected compound that has the same retention time as Apron and absorbs at 198 and 214 nm is interference.
- 3.6.2 HPLC parameters may be varied to circumvent most interference.
- 3.6.3 Retention time alone is not proof of chemical identity. Confirmation by other means should be sought when possible.

### 3.7 Calculations

- 3.7.1 A calibration curve is constructed by plotting standard concentrations versus detector response.
- 3.7.2 The concentration of a sample is determined from the calibration curve.

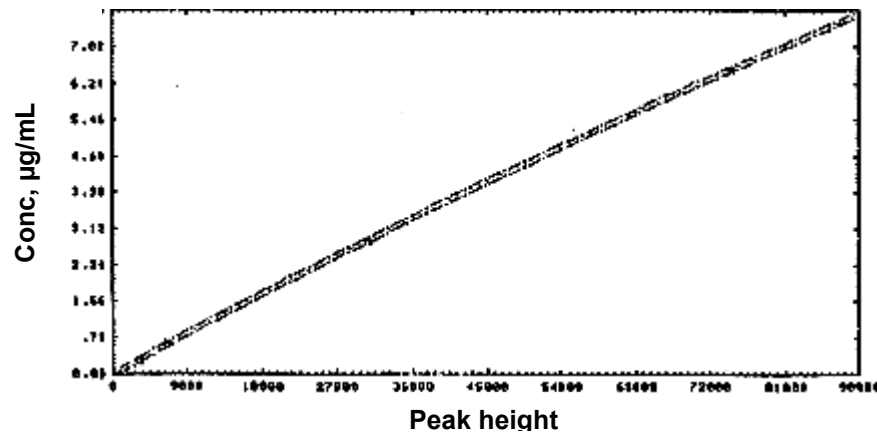


Figure 2. Apron calibration curve.

3.7.3 The air concentration is determined by the formula:

$$mg / m^3 = \frac{(\mu g / mL)(5mL)}{(air\ vol,\ L)(extraction\ efficiency,\ decimal)}$$

4 Recommendations for further study

The method should be fully validated.

5 References

- 5.1 Registry of Toxic Effects of Chemical Substances, 1983-84 Supplement, DHHS (NIOSH) Publication No. 86-103, Cincinnati, Ohio, 1986.
- 5.2 Merck Index, Tenth Edition, Merck & Co., Rahway, N.J., 1983.
- 5.3 Farm Chemicals Handbook, Meister Publishing, Willoughby, Ohio, 1981.