APPENDIX 1

Outliers Test

Every experiment is familiar with the situation in which one (or possibly more) of a set of results appears to differ unreasonably from the others in the set. Such a measurement is called an outlier. However, even when such obviously erroneous values have been removed or corrected, values which appear to be outliers may still occur. Should they be kept, come what may, or should some means be found to test statistically whether or not they should be rejected? Obviously the final values presented for the mean and standard deviation will depend on whether or not the outliers are rejected.

One way (amongst several different tests) of assessing a suspect measurement is to compare the difference between it and the measurement nearest to it in size with the difference between the highest and the lowest measurements. The ratio of these differences (without regard to sign) is known as Dixon's Q [31].

$$Q = |\text{suspect value} - \text{nearest value}| \div (\text{largest value} - \text{smallest value}) \quad \text{----- (A1.1)}$$

The critical values of Q for P=0.05 are given in Table A.1. If the calculated value of Q exceeds the critical value the suspect value is rejected.

Table A..1 Critical values of Q (P=0.05) [31].

Sample size	Critical value
4	0.831
5	0.717
6	0.621
7	0.570
8	0.524
9	0.492
10	0.464

APPENDIX 2

First Order Reaction for Carbaryl

A first-order reaction corresponds to the rate law:

$$dc/dt = k_1 C \quad \text{---------- (A2.1)}$$

The unit of k_1 are time^{-1}, such as s^{-1}. There are no concentration units in k_1. An elementary step in a reaction of the form

$$A \text{ ----------> } B$$

has a rate law of the form

$$v = -d[A]/dt = d[B]/dt = k_1[A] \quad \text{---------- (A2.2)}$$

where k_1 is the rate constant for the particular reaction. The velocity of the reaction can be expressed in terms of either the rate of disappearance of reactant, -d[A]/dt, or the rate of formation of product, d[B]/dt. The stoichiometric equation assures that these two quantities will always be equal to one another. To solve the rate-law expression, the form involving the smallest number of variables is chosen.

$$-d[A]/dt = k_1[A] \quad \text{---------- (A2.3)}$$

or $$d[A]/[A] = -k_1 dt \text{ ---------- (A2.4)}$$

In this form the variables are separated in the sense that the left side depends only on [A] and the right side only on t. Once the variables are separated, the equation can be integrated, separately on each side.

$$\int d[A]/[A] = \int -k1dt = -k1 \int dt \text{ ---------- (A2.5)}$$

$$\ln [A] = -k_1 t + C \text{ ---------- (A2.6)}$$

where C is a constant of integration.

This states that for a first-order reaction, the logarithm of the concentration will be a linear function of time [39]. A plot of ln[carbaryl] versus time already shown in Fig. 4.1 indicates that the degradation of carbaryl in this study was a first-order reaction.

APPENDIX 3

Decay Equation [33-35]

number decaying per sec = a proportionality constant characteristic of the substance × the number of nuclei remaining.

In the notation of the calculus, this is

$$-dN/dt = \lambda N \quad \text{---------- (A3.1)}$$

$$-dN/N = \lambda\, dt \quad \text{---------- (A3.2)}$$

$$\int dN/N = \lambda \int dt \quad \text{---------- (A3.3)}$$

$$\ln N_t/N_o = -\lambda t \quad \text{---------- (A3.4)}$$

If $t = t_{1/2}$, $Nt = N_o/2$

$$\ln 1/2 = -\lambda\, t_{1/2}$$

$$2.303 \log 2 = \lambda\, t_{1/2}$$

$$t_{1/2} = 0.693/\lambda \quad \text{---------- (A3.5)}$$

or $$\ln N_t/N_o = -0.693t/t_{1/2} \quad \text{---------- (A3.6)}$$

$$t_{1/2} = -0.693t/(\ln N_t/N_o) \quad \text{---------- (A3.7)}$$

Table A..2 Half-life of carbaryl by calculation.

Day (t)	Amount, N (mg/kg)	ln N_t/N	$t_{½}$
0	32.2	-	-
1	18.4	-0.560	1.24
2	13.2	-0.892	1.55
5	5.68	-1.74	1.99
8	1.54	-3.04	1.82
12	0.422	-4.33	1.92
18	0.226	-4.96	2.52
			$\bar{x}$ = 1.84 SD = 0.43 Cv%= 23.4%

APPENDIX 4

Calculation of the Lower Limit of Determination for Carbaryl

Injection volume = 20 μl

Vegetable sample = 40 g

Final volume = 3.5 ml = 3500 μl

Detection limit = 0.0008 μg/ml

= 0.0008 ng/μl

1 μl solution contained carbaryl = 0.0008 ng

20 "---------- = 0.0008 × 20 = 0.016 ng

20 μl solution contained carbaryl = 0.016 ng

3500 "---------- = $\frac{0.016 \times 3500}{20}$ = 2.8 ng

According to the experimental procedure in this work, only 5 ml were pipetted from the 100 ml sample solution. So, 40 g of the vegetable sample contained carbaryl = 2.8 × 20 ng or 56 ng.

40 g vegetable sample contained carbaryl = 56 ng

1000 g "---------- $\frac{56 \times 1000}{40}$ = 1400 ng

Lower limit of determination for carbaryl = 1400 ng/kg or 1.4 μg/kg

APPENDIX 5

Codex Maximum Limits for Carbaryl Residues [40].

Table A.3 Codex Maximum Limits for Carbaryl Residues.

Acceptable Daily Intake : 0.01 mg/kg Body Weight Residue : Carbaryl

Commodity	Maximum Residue limit (mg/kg)
Animal feedstuffs (Green):	100
Alfalfa, Bean and Pea Vines, Clover	100
Corn Forage, Cowpea Foliage	100
Soybean Vine, Sugar Beet Tops	100
Apples	5
Apricots	10
Asparagus	10
Bananas (Pulp)	5
Barley	5
Beans	5
Beet Roots	2
Blackberries	10
Blueberries	7
Boysenberries	10
Bran Wheat	20
Brassica	5
Carrot	2
Cattle, Carcase Meat (Carcase Fat)	0.2
Cherries	10
Citrus Fruit	7
Corn, Sweet (Kernels)	1
Cottonseed	1
Cow Pea	1
Cranberries	7
Cucumber	3
Eggplant (Aubergine)	5
Eggs (Shell-free Basis)	0.5

Table A.4 (continued)

Commodity	Maximum Residue Limit (mg/kg)
Goat, Carcase Meat (Carcase Fat)	0.2
Grapes	5
Leafy Vegetables	10
Melons, Cantaloupe	3
Milk	0.1
Milk Products	0.1
Nectarines	10
Nuts (Shelled)	1
Nuts (Whole in Shell)	10
Oats	5
Okra	10
Olives (Processed)	1
Olives (Unprocessed)	10
Parsnip	2
Peaches	10
Peanuts (Whole in Shell)	2
Pears	5
Peas (In the Pod)	5
Peppers	5
Plums	10
Potato	0.2
Poultry	0.5
Poultry Skin	5
Pumpkin	3
Radish	2
Raspberries	10
Rice in the Husk	3
Rice in Husk and Hulled	5
Rutabagas	2
Rye	5
Sheep, Carcase Meat (Carcase Fat)	0.2
Sorghum, Grain	10
Soybean (Dry)	1
Squash	3

Table A.4 (continued)

Commodity	Maximum Residue Limit (mg/kg)
Strawberries	7
Sugar Beet	0.2
Tomato	5
Wheat	5
Wheat Flour (white)	0.2

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