A total of 41 records of resistance, restricted to hexachlorobenzene and the benzimidazole group of fungicides, and involving 12 fungi on 17 host plants, was reported. The earliest authenticated Australian record of resistance was to hexachlorobenzene, in *Tilletia foetida* (bunt or covered smut of wheat), reported from Victoria in 1963. This is now present in South Australia and New South Wales. Resistance to benzimidazoles has been reported from Queensland, New South Wales, Victoria, Tasmania and South Australia.

The survey also requested data on the method of testing employed for confirmation of resistance. Several methods were reported:

In-vitro

(1) Germination and growth of spores and/or mycelia on agar in which the test fungicide was incorporated at a range of concentrations. This was the method most consistently reported.

(2) Germination of spores on agar in an inverted petridish with fungicide placed in the lid of the dish *(Tilletia foetida)*.

In-vivo

(1) Application of fungicide to growing plants or to soil in which plants were to be established *(Sphaerotheca fuliginea)*.

(2) Inoculated fruit subjected to dip treatment in suspension of fungicide in water (*Penicillium digitatum and P. italicum*).

(3) Fruit dipped in suspension of fungicide and then inoculated with fungus *(Sclerotinia fructicola)*.

It would be appreciated if further cases of resistance could be reported to Mr. L. C. Jones, Secretary, Co-ordinating Committee on Agricultural Chemicals, Department of Primary Industry, BARTON, A.C.T. 2600. Report forms are available from the above-named on request.

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Compiled by
LEWIS C. JONES
Secretary
Co-ordinating Committee on
Agricultural Chemicals

Persistence of benzimidazole-tolerant strains of *Venturia inaequalis* in Victoria

W. S. Washington,
Plant Research Institute,
Burnley, Vic. 3121

Tolerance of *Venturia inaequalis* (Cke.) Wint. to benzimidazole fungicides has been detected on 20 apple orchards in Victoria, mainly within 80 km of Melbourne, since 1974. Comparison of spray schedules used on these

orchards has shown that tolerance developed within 3-4 seasons even where benzimidazoles were used in conjunction with unrelated fungicides. In each instance, non-benzimidazole fungicides have since been used, and have given satisfactory control of apple scab.

Laboratory tests with conidia of *V. inaequalis* from one of these orchards have indicated that tolerance has persisted for the 3 seasons since the use of benzimidazoles was discontinued. It would therefore seem that the competitive ability of benzimidazole-tolerant strains of *V. inaequalis* will place severe limitations on the future use of these fungicides.

A Use of Computers in Epiphytology — The SANITY System

John R. Arnold
Botany Department,
University of New England,
Armidale, N.S.W. 2350

Epidemiological experiments conducted under field conditions produce large quantities of data. For example, some 200,000 assessments of disease severity were obtained from a three treatment, three replicated, split-block field trial to determine the effects of *Puccinia graminis* Pers. f. sp. *tritici* Eriks. & Henn. and *Puccinia recondita* Rob ex Desm. f. sp. *tritici* Eriks. & Henn. on the yield and quality of twelve selected cultivars of wheat. To handle the large quantity of data produced by this experiment, a series of computer programs, known collectively as SANITY, were written in ICL 1900 Extended FORTRAN IV during 1971. The aim of this communication is to describe the principles of the SANITY system of data handling and illustrate its application to the above problem. The experimental results are reported elsewhere (1).

The efficiency of handling large quantities of experimental data is inversely related to the number of transcriptions of information between recording in the field and analysis in the laboratory. However, the number of transcriptions is minimised by thoughtful design of the data sheet.

In the SANITY system, each assessment of disease severity was written once only on the data sheet at the experimental site. This optimal condition for data handling occurred because the data sheet was compatible with the card reader of the University's ICL 1904A computer. An 80 column FORTRAN coding sheet was divided into twenty columns each four characters wide. Each experimental plot required one data sheet per sample day, with one replicate sample plant filling one row of the data sheet. The elapsed time of the experiment, the disease severity assessment for each plant part and a card identification code were recorded separately in the four character columns. When the experiment was completed, the data sheets for each cultivar-treatment combination were sorted into chronological order and submitted to the Data Preparation Centre for the data to be punched onto computer cards.

At this stage of data processing, the SANITY system of programs was utilised as shown by Figure 1. The predetermined format for each card was checked by program ACDT. Cards containing errors were identified for repunching and replacement. The amount of card handling, and the concurrent risk of shuffling 17,000 cards, was minimised by loading correct epidemiological data to magnetic computer tape using program ACTL. Data on tape were rechecked by program ACDT and any elusive errors corrected with program X3GY (3).

Statistical analysis of correct data was performed by program ACMN. For each replicate plot, and independently for the whole sample, the means and standard errors were calculated for each plant part and the whole plant on each sample day. Disease progress curves for individual plant parts were plotted concurrently on common axes. Other facilities incorporated in this program could be selected to:

(i) stabilise the variance in the raw data;
(ii) test the area under the epidemic curve (4);
(iii) determine statistically the presence of slow rusting cultivars.

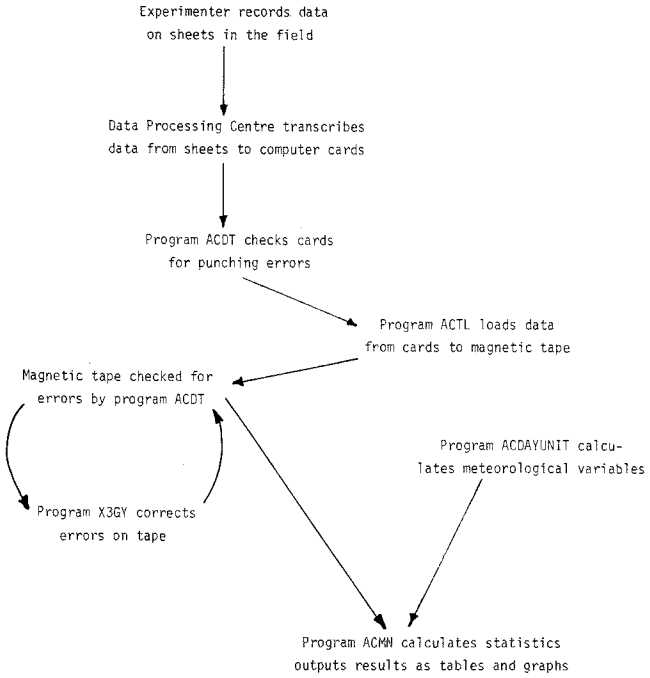

Figure 1 — A flow chart showing the steps in data handling between the first assessment in the field and the final presentation of graphs and tables by a computer using the programs ACDT, ACTL, X3GY, ACMN and ACDAYUNIT which comprise the SANITY system.

The data were then entered into the locally developed least squares regression program for linear, multiple regression and correlation analysis (2).

Meteorological data was handled in a slightly different manner. Daily or hourly data from recording devices such as hydrothermographs were transcribed manually to data sheets, punched onto computer cards and checked by program ACDT. Program ACDAYUNIT then:

(i) converted data to metric equivalents when required;
(ii) calculated cumulative totals for raw meteorological data, day units or hour units derived from a preselected base value;
(iii) listed the results as tables and graphs on the line printer.

A maximum of ten meteorological variables were plotted concurrently on a single graph.

Tables and graphs produced by programs ACMN and ACDAYUNIT were drafted to allow direct photoreproduction onto bond quality paper.