ARSENICAL RESIDUES IN POTATOES

W. F. LEONARD

Dept. of Agriculture, Christchurch

Summary

The use of an arsenical compound for haulm destruction in potato crops is widely practised. Trials were carried out on two varieties of potatoes to determine the amount of arsenic residue which might be expected on tubers when harvested.

Results showed that the use of up to 2½ times the normal rate of application did produce residues in the potatoes but the amount present was well inside the permissible limit.

INTRODUCTION

THE MAJORITY OF potato crops grown primarily for "seed" production are sprayed for haulm destruction. In the past an arsenical compound has been used on practically all of these crops and trials were laid down to measure the residual arsenic present in sprayed potatoes at harvest.

Under the New Zealand Food and Drug Regulations arsenic is permitted in fruit and vegetables to the extent of 1 ppm of arsenic. This represents 1.3 ppm of arsenious oxide, the form in which results are presented in this paper.

FIELD EXPERIMENTS

In March, 1962, a crop of Aucklander Short Top (Y-free) potatoes at Hororata was sprayed with sodium arsenite at the rates of 13 lb and 25 lb (all rates in arsenious oxide equivalent per acre). In addition, at Lincoln, a crop of the Ilam Hardy variety was treated with the same material at the rates of 10 lb and 18 lb. The lower rates represent approximately the range over which applications are commonly made in practice.

Treatments in the first trial were replicated four times and in the second trial, twice.

The haulms on the Aucklander Short Top potatoes were about 24 in. tall and of medium density. The Ilam Hardy, however, had stems 12 to 18 in. tall which were erect but almost leafless. There was therefore greater opportunity for the herbicide to reach the ground directly on the Ilam Hardy plots than on the Aucklander Short Top. Ilam Hardy is, furthermore, a shallow-growing variety.

Tubers were harvested 10 days and 32 days after spraying, separate shallow (2 to 4 in.) and deep (6 to 8 in.) samples being taken. Each sample consisted of six "table size" tubers, three collected from each of two plants.

RAINFALL

At the time of spraying, the soil at Hororata was moist, 1 in. of rain having fallen the previous week. Between spraying and the first sampling (10 days) 1.33 in. of rain fell, while over the next 22 days a further 1.69 in. fell.

The soil at Lincoln was moist to wet at the time of spraying and over the next 10 days 0.15 in. of rain fell. However, between the first and second sampling (22 days) almost 5 in. of rain was recorded at Lincoln.

RESIDUE DETERMINATION

The Auckland Short Top samples were analysed for residual arsenic at Wallaceville Animal Research Station and the Ilam Hardy

at the Dominion Laboratory. Tubers were washed and cleaned with a brush before separate determinations were done on peel and flesh, the preparation simulating that for potatoes being cooked in their skins.

The level of residues in whole tubers was calculated from the amounts present in peel and flesh.

RESULTS

Trial design did not permit statistical analysis and there was considerable variability within treatments. This may be due to the growing positions of the individual tubers making up each sample. Table 1 summarizes the results of the analyses.

AUCKLANDER SHORT TOP

TABLE 1: MEANS OF THE EFFECTS OF SPRAYING SEED POTATO HAULMS WITH ARSENIOS OXIDE (As_2O_3)

				<i>Arsenious Oxide Residues (ppm)</i>	
				<i>Flesh Only</i>	<i>Whole Tuber</i>
Lower rate (13 lb)	.....	.....	.....	0.07	0.10
Higher rate (25 lb)	.....	.....	.....	0.08	0.15
Early sampling	.....	.....	.....	0.08	0.14
Late sampling	.....	.....	.....	0.07	0.12
Shallow sample	.....	.....	.....	0.08	0.17
Deep sample	.....	.....	.....	0.06	0.09

ILAM HARDY

Pressure on analytical facilities prevented the handling of all Ilam Hardy samples. Those chosen were from the plots treated with the heavy rate of arsenic (18 lb).

Early sampling	.....	.....	.....	0.13	0.26
Late sampling	.....	.....	.....	0.10	0.23
Shallow sample	.....	.....	.....	0.14	0.29
Deep sample	.....	.....	.....	0.09	0.19

DISCUSSION

Apart from any comparisons between treatments which may be attempted, it is clear that residue levels, in both flesh and whole tubers, are well within the allowable limit. This is true even at rates of application up to $2\frac{1}{2}$ times those normally used.

As expected, the general level of residue in the Ilam Hardy variety was higher than for Aucklander Short Top but was still much lower than the 1.3 ppm of As_2O_3 equivalent allowed under the health regulations.

ACKNOWLEDGEMENTS

Help from the following persons and organizations is acknowledged with thanks: P. J. Clark, Dominion Analyst; I. G. McIntosh and D. L. Harrison, Wallaceville Animal Research Station; the Biometrics Section, Dept. of Agriculture, Wellington; C. M. Driver, Crop Research Division, Lincoln; and T. J. Smallridge, Dept. of Agriculture, Christchurch.