LETTERS TO THE EDITORS

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Resistance to the Potato Root Eelworm, *Heterodera rostochiensis* Wollenweber

I HAVE already reported some of the results of my search for resistance to the potato root eelworm among the South American tuber-forming *Solanum* species in the Commonwealth Potato Collection[1,2]. This work, begun in 1941, is now practically complete, and more than 1,200 lines, belonging to more than sixty species, have been tested in duplicate on at least one occasion. Very few have been found to be resistant; one such line, *Solanum ballsii*, has certain disadvantages for breeding work as it is a diploid, whereas the domestic potato, *S. tuberosum*, is a tetraploid. In 1948, however, I was fortunate in finding a further five apparently resistant lines (C.P.S. numbers, 1673, 1685, 1692, 1595 and 1647), four of which belong to *S. tuberosum* sub-species *andigenum*, a group of tetraploids very close to the domestic potato and readily crossed with it; the other (1647) is a sterile triploid. Tests in later years have confirmed the early promise of these lines.

The routine tests to which all lines are subjected is of a very simple sort. The plants are grown in duplicate in pots of infested soil sunk in the soil of an infested allotment. At the end of the season, the plants are lifted and their roots examined for cysts. Promising lines are selected for further test if they have few cysts on their roots; but as this may be the case for a variety of reasons, factors such as the vigour of the plant and the extent and type of root system, etc., are also taken into account. Such an assessment, clearly, is of a subjective nature, and even though the evidence of repeat tests on a larger scale may reinforce a first impression, there is no evidence, as I have already pointed out[2,3], that the assessment is sound and the apparent resistance not the result, from the present point of view, of secondary factors. However, this possibility can be tested, for, by appropriate sexual and vegetative propagation, it is possible to compare a series of genetically different clones of common parentage and of very similar general habit; the results of such experiments are now available.

In 1951, Dr. K. S. Dodds, of the Potato Genetics Station, Cambridge, which houses the potato collection, supplied Dr. H. J. Toxopeus, of Wageningen, with selfed seed of three of the lines of *andigenum* first found by me in 1948 to be probably resistant. Some of his results are reported in the accompanying communication, and it is gratifying to find that they provide strong evidence that resistance to the potato root eelworm is probably inherited. The resistance of the four *andigenum* lines likely to be useful in potato breeding is now being examined on a much larger scale, both in Holland and in England.

C. ELLENBY

Department of Zoology,
King's College
(University of Durham),
Newcastle upon Tyne.
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[1] Ellenby, C., *Emp. J. Exp. Agric.*, **13**, 158 (1945).
[2] Ellenby, C., *Nature*, **164**, 704 (1948).
[3] Ellenby, C., *Ann. App. Biol.*, **33**, 433 (1946).

Genotypical Background of Resistance to *Heterodera rostochiensis* in *Solanum tuberosum*, var. *andigenum*

IN January 1951, we received from the Potato Genetics Station at Cambridge some selfed seed of three clones of *S. tuberosum* subspecies *andigenum* which, according to the experiments of Dr. C. Ellenby, seemed as if they might serve as a basis for breeding for resistance to potato root eelworm, *Heterodera rostochiensis*.

The seeds were sown immediately, and in April five to ten cuttings were made from each of the seedlings. These cuttings were transplanted into 7-in. pots filled with sandy soil heavily infested with potato root eelworm. The pots were embedded at random in the field and several rows of pots containing the domestic variety Eigenheimer were used as controls.

Six weeks after transplanting, yellow cysts could easily be seen on the roots of susceptible plants when they were removed from the pots. It appeared that all plants of a clone were either free or nearly free from cysts, or as heavily infected as the domestic controls. The results of the inspection are given in Table 1.

Table 1. INFECTION OF *andigenum* SEEDLINGS WITH POTATO ROOT EELWORM

Parent	Number of clones	
	Without cysts	With many cysts
C.P.C. 1673	16	4
C.P.C. 1685	7	3
C.P.C. 1692	2	0

When the plants had finished growing, 20-c.c. samples of soil were taken from some of the pots and the number of cysts in each of these samples was determined. The results are given in Table 2.

Table 2. COUNTS OF CYSTS AND LARVÆ IN 20-C.C. SAMPLES OF SOIL

Material	Cysts	Viable cysts	Larvæ	Number of	
				Pots	Clones
S. tuberosum	58±6·5	47±5·4	4,300±635	10	–
S. andigenum susceptible	55±5·2	43±4·9	3,600±475	18	4
S. andigenum resistant	11±1·0	2	30	21	3
Initial potting soil	18±3·0	5±1	260±75		

It will be seen that twenty-five seedlings were apparently resistant to infection and that seven were susceptible. In the pots containing the domestic variety and the susceptible seedlings of *andigenum*, the number of viable cysts increased nearly ninefold, whereas, in the pots containing the resistant seedlings of *andigenum*, the population of cysts did not increase. These results suggest that resistance to potato root eelworm is inherited; but the progenies used were too small to permit an interpretation of the genetic mechanism involved.

S. tuberosum subspecies *andigenum* is cultivated in the Andean regions from Venezuela to northern Argentina, and apparently is closely related to domestic varieties, which represent only a small part of this very variable species. For this reason resistant *andigenum* varieties would seem to offer a very good basis for a practical breeding programme, and their possibilities are now being examined on a much wider scale.

H. J. TOXOPEUS
C. A. HUIJSMAN

Institute of Agricultural Plant Breeding,
Foundation for Agricultural Plant Breeding,
Wageningen. Sept. 29.