the multiplication of vegetative cells and not by their destruction in media poured at 100°.

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Maleic Hydrazide in the Control of the Bulbous Weed *Oxalis pes-caprae*

A NUMBER of reports have appeared in the literature to the effect that preharvest application of maleic hydrazide to the foliage of plants like potatoes[1,2,4], carrots[3], onions[3,4,6], and sugar beets[4,5] inhibited subsequent sprouting during storage or in the field. With this information at hand a preliminary study was carried out in order to test the possibilities of using maleic hydrazide in the control of the bulbous weed *Oxalis pes-caprae*, which has proved resistant to herbicides of the 2,4-dichlorophenoxyacetic acid type.

The bulbs of *O. pes-caprae* are usually distributed from soil surface to a depth of 12–18 in., the plants emerge above surface in April and die off completely by the beginning of summer in October, leaving behind the new generation of bulbs. These bulbs start sprouting in February, but growth is very slow until the first rains in April.

Potted plants of *O. pes-caprae*, started from bulbs, were sprayed with 0·15 per cent and 1·5 per cent maleic hydrazide (percentage concentration of active ingredient in water plus detergent) to run off on four different dates. In November the bulbs produced by these plants were counted and then planted back into pots (about ½ in. below surface) in order to observe their sprouting behaviour. The number of bulbs produced by the treated plants and the percentage of final sprouting are indicated in Table 1.

Table 1

Date of treatment	Concentration of maleic hydrazide (per cent) 0·15		1·5	
	No. of bulbs per 15 plants	Total sprouting (per cent)	No. of bulbs per 15 plants	Total sprouting (per cent)
May 5	66	100	51	35
June 7	64	62	23	0
July 3	89	35	108	10
September 5	111	62	118	13
Control	90	100	90	100

These results indicate that at both maleic hydrazide concentrations there is a reduction in the number of bulbs produced after an early treatment, the effect being more pronounced in the higher concentration. Late treatment does not reduce the number of bulbs. This can be explained by considering the developmental stage of the plant at the treatment times. Generally, bulb production starts towards the end of June; in consequence maleic hydrazide sprayed before that stage may, by virtue of its antimitotic action[7,8] and general retardation of the growth of the plant, interfere with the formation of these bulbs. From July onwards, when the bulbs are in the process of enlargement, application of maleic hydrazide does not affect the number but reduces the size and at the higher concentrations may result in deformed bulbs.

However, from the practical point of view the reduction in bulb numbers is not so significant as the long-term effect of maleic hydrazide on the sprouting of the bulbs; all treatments, with the exception of the earliest application of 0·15 per cent, had a definite inhibitory effect on sprouting which was particularly pronounced in the three later applications of 1·5 per cent maleic hydrazide. A number of the bulbs which sprouted developed abnormally shaped shoots with atypical scale-like leaves; some of these eventually recovered and produced normal rosettes with trifoliate leaves. The bulbs which did not sprout perished in the soil by the end of winter.

Large-scale field trials have been laid out in order to assess the practicability of using maleic hydrazide in the control of *O. pes-caprae* in heavily infested land. In view of the rather high concentrations of maleic hydrazide necessary for a satisfactory inhibition of sprouting, it is doubtful whether it could be used as a selective herbicide concurrently with the growth of crops or pastures, although it may prove valuable as a pre-sowing treatment.

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Heterogeneity of *R*-Enzyme

Hobson, Whelan and Peat[1] showed that *R*-enzyme preparations from broad beans and from potatoes brought about the following changes in the properties of amylopectin: (*a*) an increase in the capacity to combine with iodine as reflected in the blue value[2]; (*b*) a reduction in the viscosity of solutions; (*c*) an enhanced susceptibility to β-amylolysis. Such preparations were also found by Whelan *et al.*[3,4] to catalyse the hydrolysis of the 1 : 6-glucosidic bonds of the limit dextrins produced by the action of salivary α-amylase on amylopectin.

Recent separations of the enzymes of malted barley by chromatography on alumina led to the detection by Harris, MacWilliam and Phillips[5] of a number of components of which one, while resembling *R*-enzyme in its attack on amylopectin, differed from it in failing to act on the above-mentioned limit dextrins. On the other hand, another component brought about the rapid hydrolysis of limit dextrins in the same manner as the *R*-enzyme preparations studied by Whelan *et al.*[3,4] but, by contrast, was without apparent action on amylopectin.

It has now been shown that when preparations of *R*-enzyme, obtained from broad beans by the method of Hobson *et al.*[1], are similarly chromatographed on alumina, two separate active fractions are obtained.