EFFECT OF BURIAL DEPTH ON DOCK ROOT REGROWTH

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Summary. Regrowth of broad-leaved dock, *Rumex obtusifolius*, and curled dock, *R. crispus*, from root fragments was studied. Shoots developed more readily from crown material than from taproots, and more shoots emerged from shallow planting depths. In broad-leaved dock, the ability of taproots to send up aerial shoots, and the size of those shoots, depended on depth of burial of the taproots, and on the medium they were growing in. Under the conditions of these experiments, burying taproots 20 cm deep reduced, but did not stop them sending up shoots. Suggestions for improved experimental technique are made.

INTRODUCTION

Broad-leaved dock, *Rumex obtusifolius*, and curled dock, *R. crispus*, are problems in pastures (6), and in crops farmed without pesticides in New Zealand, and in Britain (1). In New Zealand, plants regrowing from roots adversely affect yields during the cropping phase of rotations (6). Cultivated fallows are the most commonly suggested method for the cultural control of docks (1), but we have found this less effective for dock control than for couch, *Elytrigia repens*. The regrowth ability of dock roots has been studied in New Zealand (4) and Britain (5). Only the upper 7.5 cm of broad-leaved dock root and the upper 4 cm of curled dock root can give rise to shoot buds (4). Work on couch in both America (8) and Europe (3) showed that the ability of buried rhizome fragments to regrow depended both on fragment size and depth of burial. Broad-leaved dock roots buried 20 cm deep by ploughing can produce vegetative stems from that depth (2). The studies reported here were preliminary attempts to examine the effects of burial of root fragments on the speed and vigour of shoot emergence.

METHODS

Roots of broad-leaved dock and curled dock were collected in the field in early December from mature plants which were in flower or beginning to flower. In three experiments, tap roots (including crowns) or parts of roots were buried horizontally in either soil (Manawatu silt loam) or sand in 4.5 litre black plastic bags, which were then placed outside and watered regularly. In Experiment 1, root systems of *R. obtusifolius* were separated into crowns (upper 2.5 cm of tap root), main tap roots (7.5 cm long, taken from below crown) and secondary tap roots (7.5 cm long), and those of *R. crispus* were separated into crowns and main tap roots. On 3 December 1992, four units of each part were buried in each bag, in either moist soil or sand, at a depth of 5, 10, 15 or 20 cm. The 40 treatments were unreplicated and arranged at random. Experiment 2 was planted on 7 December, and Experiment 3 on 14 December 1992. In these two experiments, each root unit, the intact uppermost 8 cm of taproot (including crowns) of *R. obtusifolius*, had its volume measured by water displacement, and a sample of units was dried to constant weight. Four such units were buried in each 4.5 litre black plastic bag, in moist soil or sand, at 5, 10, 15 or 20 cm depth. In these two experiments, each treatment was replicated 7 times.

Experiment 1 was destructively harvested on 18 January, 46 days after planting. Experiment 2 was harvested on 22 January, also 46 days after planting, and Experiment 3 on 9 March, 85 days after planting. At these final harvests, emerged and unemerged shoots were counted. In Experiments 2 and 3, the dry matter of each root and its attached shoots was also assessed.

RESULTS AND DISCUSSION

In Experiment 1, the average volume and dry weight of curled dock crowns was 14.6 cm^3 and 2.7 g, of curled dock taproots was 13.5 cm^3 and 1.9 g, of broad-leaved dock crowns 23.8 cm and 3.9 g, and of broad-leaved dock taproots 13.5 cm^3 and 2.4 g.

In Experiment 1, numbers of shoots at final harvest were similar in both soil and in sand. Although the treatments were not replicated, so that statistical analysis was not possible, more shoots emerged from crowns than from taproots (Table 1). No shoots at all emerged from secondary taproots.

Table 1. Experiment 1. Numbers of shoots emerged (per planted root fragment) above soil surface at final harvest, averaged over both planting media and 5 and 10 cm planting depths.

	curled dock	broad-leaved dock
Crowns	2.2	1.7
Taproots	1.2	0.6

As shown in Table 2, fewer shoots emerged from the more deeply buried crowns, but the shoots not emerged at that time could have emerged later.

Table 2. Experiment 1. Numbers of shoots per planted crown at final harvest, averaged over both dock species and both planting media.

Planting depth (cm)	5	10	15	20
Emerged	1.9	1.9	0.9	0.3
Unemerged	0.1	0	0.9	0.9

At the final harvests of Experiments 2 and 3, the numbers of emerged shoots declined with increased depth of taproot planting (Table 3). More shoots emerged from roots planted in sand than from those planted in soil, and this difference was particularly marked in Experiment 2. At the time of harvest of Experiment 2, there were also more unemerged shoots in sand than in soil, especially at the greater depths. Few unemerged shoots remained by the time Experiment 3 was harvested, suggesting that the shoots still unemerged when Experiment 2 was harvested may have died without emerging.

Mean dry matter of roots and associated shoots at harvest in Experiments 2 and 3 are shown in Fig. 1. In both experiments, dry weights of plants from more deeply planted roots tended to be lower, presumably because of the extra resources needed for shoot emergence from depth.

Table 3. Numbers of emerged and unemerged shoots present at final harvests of Experiments 2 and 3. For all least significant differences (l.s.d.), p = 0.05.

	Planting depth (cm)					Planting medium		
	5	10	15	20	l.s.d.	soil	sand	l.s.d.
Emerged shoots per planted root								
Experiment 2	1.9	1.8	1.5	1.2	0.43	2.5	0.7	0.32
Experiment 3	2.0	1.8	1.1	1.0	0.42	1.8	1.2	0.03
Unemerged shoots per planted root								
Experiment 2, soil	0.4	0.7	1.1	2.0				
sand	0.7	2.0	3.5	4.0	0.17			
Experiment 3	0.02	0.24	0.44	0.81	0.454		not significant	

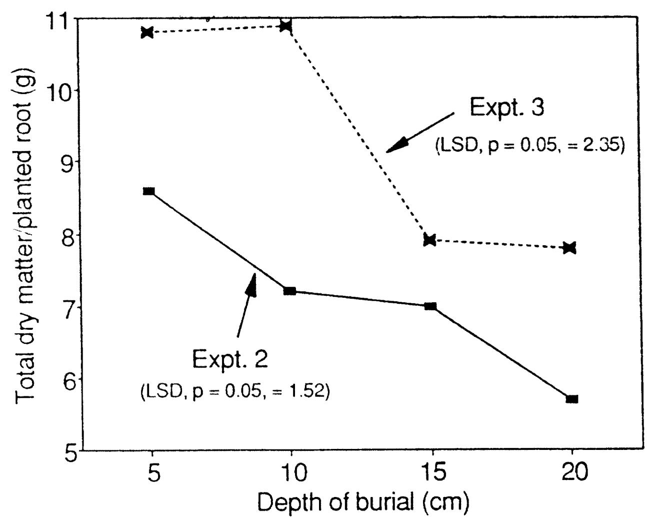

Figure 1. Dry matter of dock plants (roots and shoots) per planted root at harvest of Experiments 2 and 3.

Sand grown plants tended to show more red colouration and had smaller leaves and flowers than those grown in soil, besides having lower dry weights. Differences in growth in sand and soil may have been due to nutritional, moisture or temperature effects. Numbers of shoots emerging from roots in the two media may also have been affected by moisture or temperature, or by the differences in their physical characteristics.

In some plastic bags, especially those containing soil, shoots from deep planted roots often grew up between the soil and the sides of the bag. This may have been due to light penetrating where the soil shrunk away from the sides of the bag, or to this being an easier route for shoots to follow. A better technique may be to bury dock roots in the ground and observe their regrowth.

The evidence presented here suggests that burial as deep as 20 cm slows the growth and development of regrowth from dock roots, but it does not prevent roots from regrowing. Even deep ploughing and burial of dock roots is therefore unlikely to give adequate control. However, more work is needed on the effects of burial on dock root regrowth, because of possible deficiencies in the experimental techniques used here.

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