SOME ASPECTS OF THE AUTECOLOGY OF *OXALIS LATIFOLIA* H.B.K.

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Summary

In experiments on a form of *Oxalis latifolia* it was shown that monthly defoliation or cultivation once a year did not influence yield of bulbs but yield was proportionately depressed by more frequent defoliation and many plants died; from a planting depth of 3 in. leaves from all bulbs reached the surface and from 16 in. no leaves appeared, from 9½ in. leaves from 20% of the bulbs reached the surface. Some taxonomic implications are outlined.

INTRODUCTION

IN SPITE of the advances made in chemical methods of weed control, the problem of selective eradication of the bulbous *Oxalis* spp. remains. This difficulty of control by chemicals or by hand picking has led to some sweeping statements on the survival capacity of some species. This preliminary investigation tested the reactions of *O. latifolia* to depth of planting, simulated cultivation and rates of defoliation.

TAXONOMIC CONSIDERATIONS

The purple flowered specimens with sharply-angled leaf lobes are well known in New Zealand and in many other countries. The plant conforms to the description of *O. latifolia* and the experiments of Hunter and Over de Linden (1958) and of Jackson (1960, 1962) were with this entity. In almost every country where *O. latifolia* grows, a pale flowered form with more rounded leaf lobes occurs. This appears to be the plant which Young (1958) stated to be "now so common in Devon and Cornwall". He was unable to place it in any specific category. This form is the abundant *Oxalis* of Palmerston North. Another entity, and probably another form of *Oxalis latifolia*, occurs sparingly in Palmerston North. The distinguishing characters of the described species and its assumed variants are set out in Table 1 and illustrated in Fig. 1. Although the section

TABLE 1: FORMS OF *OXALIS LATIFOLIA*

<i>Oxalis latifolia</i> (described species) Fig. 1a	<i>Oxalis latifolia</i> (pale flowered form) Fig. 1b	<i>Oxalis latifolia</i> (mid-styled form) Fig. 1c
Leaflets acutely deltoid; surface not glossy. Bulbils on conspicuous runners and producing leaves while still attached to bulb. Inflorescence umbellate. Petals petunia purple (Hort. colour chart): short-styled; outer filaments slightly shorter than sepals; inner filaments with appendages.	Leaflets obtusely deltoid; surface not glossy. Bulbils nearly sessile and producing leaves after de- tachment from bulb. Inflorescence umbellate. Petals whitish to pale pink; short-styled; outer filaments slightly shorter than sepals; inner filaments with appendages.	Leaflets nearly orbicular; surface semi-glossy. Bulbils nearly sessile and producing leaves after de- tachment from bulb. Inflorescence cymose. Petals orchid purple (Hort. colour chart); mid-styled; outer filaments much shorter than sepals; inner filaments lacking appendages.

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IONOXALIS in Salter's revision (1944) contains but one species (*Oxalis latifolia*) and admits no variants, the writer's separation of the plants as distinct entities is warranted because of their morphological and ecological differences.

METHODS

Preserved fruit tins 6¾ in. high by 6¼ in. in diameter were used as containers in the experiment. For the 9½ in. planting depth two tins were soldered together and the bottom removed from the upper one. For the 16 in. planting three tins were used. To allow free drainage all were perforated on the bottoms. The tins were filled with coarse sandy loam and set into the ground in rows. Two bulbs ¼ in. in diameter were planted in each, 10 tins being used for each treatment.

TREATMENTS

In the depth of planting trial, bulbs were planted at 3 in., 9½ in. and 16 in. and received no further treatment. Those planted at 3 in. were taken as controls throughout. Bulbs in the defoliation trial were planted at 3 in. and after emergence were defoliated weekly, fortnightly and monthly at ground level during the growing season (October to May). In the cultivation treatment bulbs were planted at 3 in. and when the foliage had disappeared each June the soil was disturbed to separate the bulbils from the parent bulbs.

The trial began in October, 1958, and was terminated in May, 1961. The period covered three growing seasons.

RESULTS

DEPTH OF PLANTING

- (1) Leaves appeared on all bulbs planted at 3 in. and between October and May each year growth and flowering was comparable with plants growing in gardens.
- (2) From 9½ in. leaves appeared on 4 of the 20 plants in the treatment and re-appeared each spring. Leaves were few in number and always exceeded 2 in. in diameter. This is characteristic of leaves from deep bulbs in gardens also.
- (3) No leaves appeared on bulbs planted at 16 in.

DEFOLIATION

- (1) All plants survived weekly defoliation for one growing season, but approximately one-third did not reappear the following spring. At the end of the third growing season 9 depauperated plants remained alive.
- (2) Fortnightly defoliation for 3 seasons killed 9 of the 20 plants. The remainder were very weak.
- (3) All plants survived monthly defoliation.

CULTIVATION

All plants grew normally.

TABLE 2: YIELD OF BULBS AND BULBILS IN ALL TREATMENTS

Treatment	Percentage Survival	Yield of bulbs and bulbils	
		Average number per plant	Average dry weight per plant (g)
Control	100	241.0	7.64
Planted 9½ in.	20	193.0	6.44
Planted 16 in.	0	0	0
Defoliated weekly	45	7.0	0.36
Defoliated fortnightly	55	37.0	0.86
Defoliated monthly	100	197.8	6.24
Cultivated	100	231.3	8.06

Comparing both monthly defoliation and the cultivation treatment against control gave no significant difference in number or weight of bulbs and bulbils at the 1% or the 5% levels of significance.

DISCUSSION

The experiment has demonstrated the inability of *O. latifolia* to withstand frequent regular defoliation. However, this cannot be recommended as a practical means of control of the weed. Defoliation may eventually kill plants but bulbs and bulbils lying dormant in the soil would ensure survival. The length of time a bulb can remain dormant is unknown but it is considered to be a number of years. In the experiment all bulbs from the deep planting were dead within three years but it is probable that a fairly high water-table for short periods each winter hastened death.

Adequate evidence is given of the inability of leaves of *O. latifolia* to reach the surface from the great depths frequently quoted. In gardens, leaves appear from bulbs 9 or 10 in. deep but seldom from greater depths and certainly not from 24 in. Investigation of all such claims revealed that, when the top soil containing bulbs and bulbils was buried, inadequate care was taken to prevent contamination of the newly exposed soil. Plants appearing were then from these stray bulbs and bulbils near the surface and not from bulbs and bulbils in the buried topsoil.

The cultivation treatment gave unexpected results. Young, referring to *O. latifolia*, *O. corymbosa*, and *O. pes-caprae*, stated "Their bulbils are almost indestructible, and are produced in great numbers if the plants are disturbed or decapitated." This same view is held by many, who assume that the apparent restraint of the parent bulb on the bulbils close to it, is broken when the bulb and bulbils become separated. In the experiment there was a slight reduction in number of bulbs and bulbils and a small increase in their weight per plant but differences were insignificant. This aspect requires further investigation.

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Review of Discussion

CHEMICAL PLOUGHING SESSION

Sessional Chairman: L. J. MATTHEWS

THE OBJECTS of the experiments in the two papers reported were:

- (a) To test the hypothesis that, if it is dry enough to cultivate, then it is too dry for the chemical method. This was attempted by sowing crops at earlier intervals than for normal cultivation.
- (b) To evaluate whether a fallow period is necessary for high fertility land.

For these comparisons, an essential prerequisite for chemical ploughing is complete kill of all vegetation.

These primary objectives were overlooked by placing emphasis on the comparison of the relative effectiveness of paraquat and 2,2-DPA/amtrole mixtures. On today's knowledge, it is possible to introduce a chemical fallow period, and knock out any vegetation regenerating at the time of drilling or oversowing. 2,2-DPA/amtrole mixtures followed by paraquat/diquat complex, respectively, are the most suitable chemicals to date.

If the main weakness of the trial is ignored, the experiments do show:

- (a) That crops should be drilled earlier than for normal cultivation, particularly in a dry season.
- (b) A fallow period is not advantageous on high-fertility land. However, in a dry season the fallow period would conserve moisture. It would also ensure that all vegetation was killed or severely checked before the crops were sown. It is considered Mr Thompson penalized paraquat in his trials.
- (c) The mixture 2,2-DPA/amtrole followed 2 to 4 weeks later by paraquat or diquat is satisfactory, but for greater practicability it is essential to have a broad-leaved weedkiller with the properties of paraquat. This is a challenge for the future.

The main discussion revolved about the practicability of the chemical method. To support its practicability, the various workers who had undertaken specific trials with chemical ploughing were in favour of the method. To date, some 4,000 acres of nassella tussock (*Nassella trichotoma*) has been successfully controlled. Flax (*Phormium tenax*) is being planted commercially, and at research stations the chemical method has been used as a research tool for some years. It is suggested, though, that if a fallow period had to be introduced between application and sowing, some of the value of the method would be lost. However, it appears necessary to follow cultivation practices carefully, and, if a fallow period was necessary in cultivation, then it was also necessary for the chemical method.