OXALIC ACID SYNTHESIS IN *OXALIS PES-CAPRAE* (L.).

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GENERAL INTRODUCTION

Oxalis pes-caprae (Soursob) is among those plants which contain notable amounts of oxalic acid. Indigenous to South Africa (Salter, 1944), *Oxalis* was introduced into South Australia as an ornamental plant in 1839. So rapid and effective was its spread, that by 1879 it was recognised as a weed in cultivated areas (Schomburgk, 1879). The present distribution of *Oxalis pes-caprae* in the cultivated areas of South Australia has been reviewed by Michael (1959).

Agriculturally *Oxalis* presents a problem, not only because of its widespread distribution and successful competition with more favoured pasture species but also because of its high oxalic acid content which causes a chronic nephritis in sheep depastured on *Oxalis* dominant areas. In simple stomached animals, a hypocalcaemic syndrome has been associated with excessive oxalic acid ingestion. Experiments with sheep (Dodson, 1959) have shown that oxalic acid poisoning in these animals is associated with physical rupture of the kidney tubules due to crystallisation of oxalic acid, rather than hypocalcaemia. Losses as high as 10% as a result of *Oxalis*-induced nephritis have been reported in some flocks of sheep. The tolerance of sheep to oxalic acid is dependant upon the presence in the rumen of certain bacteria capable of decarboxylating oxalic acid. These bacteria are associated with _Oxalis_ stands in the field. They are only found in the rumen of the sheep ingesting _Oxalis_ at the time of the year when soursob is flourishing (Dodson, 1959). The severity of oxalic acid poisoning depends on the initial inoculum of these degradative bacteria present in the rumen when sheep graze on _Oxalis_. Animals reared in areas in which _Oxalis_ is not prevalent are very susceptible to nephritis when brought into pastures infested with this weed.

Measures employed to control the growth and spread of _Oxalis_ have proved inadequate. Cultivation has never been entirely effective, although repeated cultivation at the stage when the bulb from which the plant grows is nearly exhausted exerts a temporary setback to _Oxalis_. Not only can broken portions of the plant regenerate, but newly formed bulbs, pulled down into the soil by a contractile root as far as eighteen inches, are well clear of the effects of cultivation.

A wide range of weedicides has been applied to mature _Oxalis_ plants, but none has been effective in controlling growth. No approach has been made to a selective attack on the plant. The experiments described here have been designed to elucidate the mechanism of oxalic acid synthesis in _Oxalis_. If this biosynthesis is obligatorily coupled with the growth of the plant, then selective inhibition of an enzyme (or enzymes) essential to this synthesis may result in control of the plant. Although all plants probably contain some oxalic acid (Bennet-Clark, 1933), an excessive amount of this acid is found in only a small number of plants (see Michael, 1959), so that inhibition of formation of this major product of metabolism in *Oxalis* provides a possible avenue for selective control.

The white emergent shoots of bulbs of *Oxalis pes-caprae* rapidly synthesise oxalic acid and contain as much as 16% of oxalic acid on a dry weight basis. The shoots have been used throughout this study since they represent the starting point of the growth of the plant, and therefore the logical stage for selective control. Moreover, the biosynthesis of oxalic acid could be studied in white *Oxalis* shoots without the added complications of photosynthetic reactions.