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THE DOUBLEGEE

By G. R. W. MEADLY, M.Sc., Officer-in-Charge, Weeds and Seeds Branch

DOUBLEGEE, like a number of other major weeds, is native to South Africa. It was introduced to Western Australia during the first years of settlement.

There is no more troublesome weed in Western Australia than doublegee. It competes strongly with crop and pasture and its spiny fruits penetrate the hoofs of stock, causing lameness.

Doublegee is a quick-growing annual which soon produces a strong taproot and forms seeds at an early stage of growth. Dormant seeds continue to germinate for a number of years and a succession of germinations often occurs in the one season.

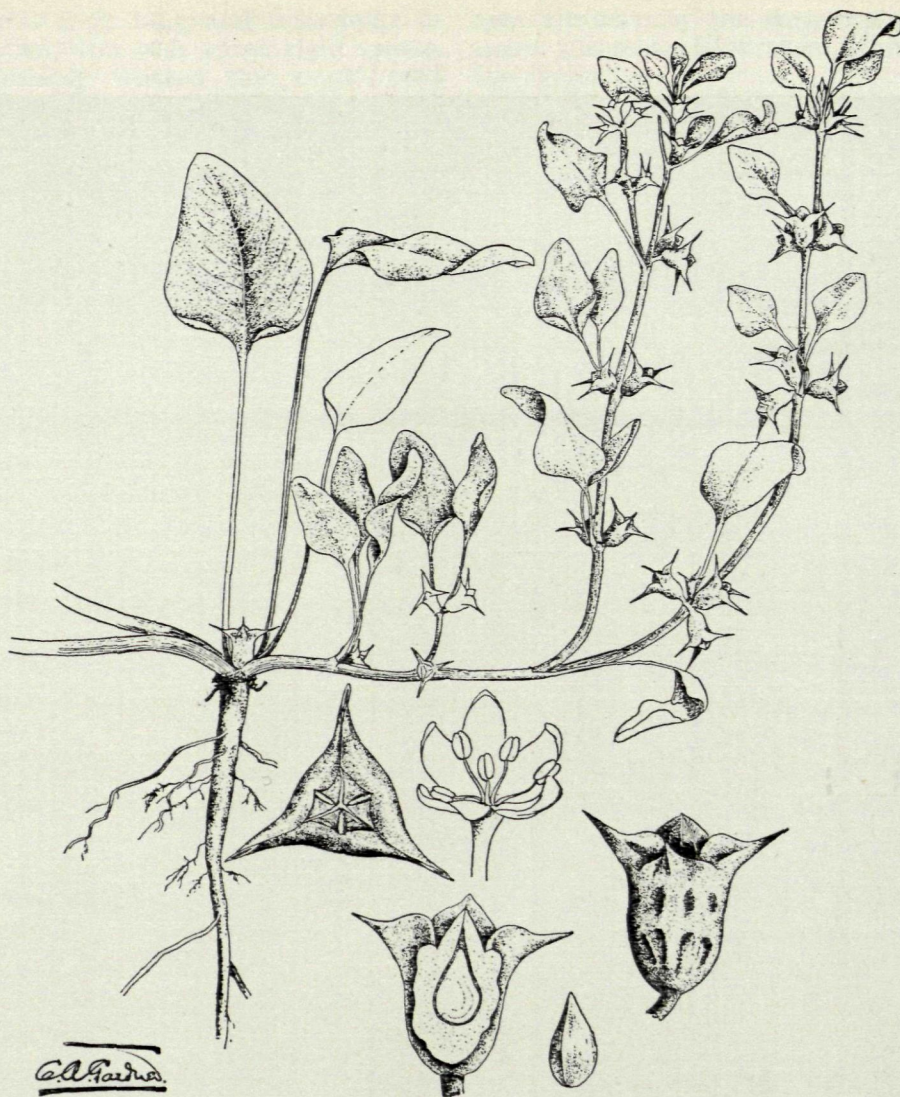
The seedlings are capable of surviving adverse conditions and making rapid recovery.

An article in the Sydney Morning Herald of December 7, 1912, read as follows—"In 1830 the ship Margaret left Bristol, England, with passengers for the Swan River Settlement and during the voyage called at Cape Town, where one of the intending settlers procured some seeds of the so-called Cape spinach, a plant known to botanists as *Emex australis*, with the view of cultivating it in the land of his adoption. In due course the seeds were sown in a garden and the resulting plants grew vigorously but instead of being a useful and palatable vegetable it has proved to be one of the most obnoxious weeds ever acclimatised in Western Australia."

At first the plant spread mostly in the coastal areas near Geraldton, later extending to the Murchison and Gascoyne and eventually to the Kimberleys.

It is now widespread in the pastoral areas and is also a serious pest in many parts of the wheatbelt besides causing concern in parts of the South-West. In the North-West it is mainly located along the rivers, but further south has a more general distribution. Although growing most vigorously on heavy soils it is by no means restricted to them.

Until about 1870, doublegee was not recorded from any other State, but it then appeared in South Australia where it is



DOUBLEGEE

(*Emex australis* Steinh.)

Portion of plant showing habit of growth. Subsidiary drawings show details of fruits, flower and seed

Drawing by C. A. Gardner.

known as "spiny Emex" or "three-cornered jack." It was later recorded in Victoria and New South Wales and was reported from Queensland in 1911.

DESCRIPTION

The name doublegee is derived from dubbeltge-doorn, the Afrikaan for devil's thorn—an appropriate title.

It is a vigorous, spreading annual with rather fleshy prostrate or ascending stems up to several feet long, and a long thick taproot. The leaf blades, mainly two to three inches long, range from oval to triangular and are on stalks of about the same length.

The flowers are inconspicuous, but the fruits are very distinctive. They are woody,



DOUBLEGEE

(*Emex australis* Steinh.)

Doublegee was introduced from South Africa as a vegetable in the early days of settlement and now occurs in most parts of the State. Besides causing lameness in animals it competes vigorously with crops and is hard to control

one quarter inch long and triangular in cross section, and bear three rigid spines. Unless harshly treated the single seed remains enclosed in the fruit.

Doublegee is a member of the family *Polygonaceae*, which also includes docks, sorrel and wireweed.

SIGNIFICANCE

Doublegee is not relished by stock and usually is only eaten when grazed accidentally along with other herbage.

Although not generally regarded as a toxic species it contains oxalic acid and, in a recent case investigated by officers of the Department of Agriculture, field evidence indicated that doublegee was responsible for the loss of three rams. In this case practically the entire herbage consisted of young doublegee plants.

It competes vigorously with useful plants and is a problem in cereal crops, especially on the heavier soils. Doublegee is also troublesome in pastures but not to the same extent as on arable land.

Many cases of animals becoming lame and crippled have been caused by the rigid spines of the fruits penetrating their hoofs. The spines are so placed that one can always be expected to be in a vertical position. Such lameness is particularly serious in travelling stock and makes animals more vulnerable to the attacks of dogs and foxes. Sheep having soft hoofs after transport by boat are likely to suffer severely as also are young lambs. Doublegees can also be uncomfortable and even dangerous for bare-footed children and have been the cause of many punctured bicycle tyres.

CONTROL

Since the original introduction in the early days of settlement, the weed has been spread extensively. There are now few districts in the State where it does not occur.

Rubber-tired vehicles, including aeroplanes, have been important distributing agencies, along with stock, hay, chaff and poorly-graded lines of subterranean clover seed. In clover seed the doublegees themselves may be present, often with the

spines broken by the threshing, or sometimes the seeds have been removed from the fruits.

The seeds are similar in shape to those of a dock.

Although an annual, doublegee is a particularly difficult weed to control. This is due to several characteristics. The plants seed very freely and the first seeds are formed at an early stage of growth when the plants are comparatively small. Again, the fruits are well-adapted for spreading and the protected seeds retain their vitality for many years.

Cultural Methods

Where only isolated plants are present, they should be grubbed and, if bearing seeds, destroyed by burning.

Small infestations can be confined by fencing to prevent spread by stock and taking care to avoid distribution by vehicles and machinery.

With large areas, cultural methods provide the most effective means of control. Shallow cultivation in February and March will induce a high percentage of germination with the first winter rains, after which further cultivation will do much to destroy the seedlings.

In the wheatbelt, in cases where doublegee control is the primary objective, a modified crop rotation is then often desirable. This involves alternating an early variety of wheat with fallow for some years. The use of an early variety allows a cultivation to be made following germination after the first rains. Some farmers favour a three-year rotation—clean fallow, wheat and oats—the oats, for grazing, replacing the pasture year. Such rotations are dictated by the weed infestation and no doubt would not be followed in the absence of doublegees.

The working of the land should be designed to induce germination and exhaust the supply of seeds in the soil. Deep ploughing is not favoured, as seed buried in this way can be expected to germinate when brought to the surface by subsequent workings, even if these are delayed for a number of years.

In areas where pasture establishment is possible, sowing clovers and grasses, with liberal dressings of superphosphate, has checked the growth of doublegee.

Farmers prefer to leave heavily-infested land under clover for an extended period before cropping because germination of the weed is stimulated as soon as the soil is worked.

Herbicides

The hormone-like herbicides do not give satisfactory control of the doublegee.

This is surprising because the habit of the plant and the fact that it is an annual suggest that it should be susceptible to moderate rates of application. However, this is not the case. Results of Department of Agriculture trials started when these chemicals first became available have not been encouraging.

Farmers have claimed varying degrees of success with use of different 2,4-D formulations while some of our trials have caused a marked suppression of growth and, in some cases, a high degree of control. After many detailed investigations extending over several years, however, we are unable to recommend a treatment that is likely to give consistent results and destroy a high proportion of the plants. This does not mean that in some cases spraying is not warranted in order to reduce the competitive effect of the weed.

Trials with Dinoc (30 per cent. sodium dinitro-orthocresylate) gave more promising results.

A high degree of control of seedling doublegees was obtained by spraying with a solution of Dinoc in water in the proportion of 1 : 100 by volume. Two pounds of sulphate of ammonia was added to each 100 gallons of solution. In the case of small plants, satisfactory results were obtained with applications of 100 gallons per acre and although cereals were "tipped" to a certain extent no permanent injury was caused.

This method has been used for the control of doublegees in cereal test rows at research stations but is scarcely practicable for extensive areas for two reasons. First, the cost of chemical exceeds 30s. per acre and second, high volumes must be applied, calling for large quantities of water and making low-volume equipment unsuitable for application.

Small areas can be destroyed by spraying with chemicals such as sodium

chlorate, altrazine and monuron. One pound of sodium chlorate or one ounce of the other preparations dissolved in one gallon of water is a suitable solution and will spray 30 square yards. These treatments are not selective and will affect pasture plants. Treatment over a period of years is necessary to cope with dormant seeds.

Trials with Herbicides

Trials with hormone-like herbicides have been carried out at many centres using different rates of a number of formulations applied by means of ground boom units and aircraft. Within a few days of spraying with these chemicals the doublegee plants usually show formative effects, these being most pronounced in the case of seedlings. The leaves tend to twist and become more erect and a swelling develops at the base of the stem. A splitting of the runners is a characteristic symptom, and the growth of the weed is generally depressed. Malformation and proliferation of floral parts also occurs.

Even with rates as low as 4 oz. acid equivalent per acre some of the smaller plants usually succumb. The degree of effect on the remainder is variable. The growth of some is scarcely interrupted while others, although showing obvious injury, make renewed growth from terminal growing points. Plants affected more severely form shoots from near the base of the stem. Those which recover produce a number of normal viable seeds.

Various formulations of 2,4-D used at a wide range of acid equivalent levels have not proved consistently effective against doublegees and could not be considered as a means of eradicating this plant or even causing a reduction in regeneration the following year.

The most effective results followed two applications of herbicide within a fortnight. At the Chapman Research Station, Nabawa, complete control was obtained with all double treatments including 6 oz. acid equivalent per acre of 2,4-D amine. With this trial, however, a high degree of control was obtained with a single treatment of 6 oz. acid equivalent of the amine, while the same range of treatments used at Beverley in the same season did not give any significant control.

As with a number of other weeds, somewhat better results have been obtained under crop than under pasture conditions. The spraying of doublegees in a crop, particularly when other susceptible weeds are present, could be economic in areas where this weed is vigorous and strongly competitive. Although a high proportion of kill cannot be expected, 6 oz. of acid equivalent per acre of the ester of 2,4-D has caused suppression of growth for a period and could result in considerable advantage to the crop if applied when the weeds are small. Doublegees generally have been affected to a greater extent by the ester than by similar quantities of the amine or sodium salt of either 2,4-D or M.C.P.A.

The volume of solution does not appear to be an important factor, as was suggested at one stage. Reducing the volume from eight to four gallons, applied with a low-volume boom caused no improvement and similar results followed the application of the same quantity of active chemical in two gallons per acre by means of an aircraft.

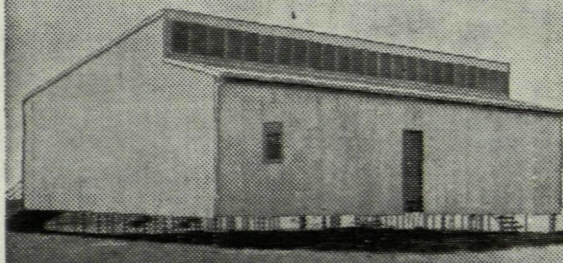
There is evidence that treatments are more effective in the northern parts of the wheatbelt, possibly associated with more rapid growth in the early part of the season. This apparent advantage is offset by the fact that, in those districts, doublegees tend to germinate over a longer period.

Further research is in progress, financed by the State Wheat Research Fund. Several aspects are being investigated including factors affecting dormancy and the influence of competing pasture species.

Additional herbicides are also being tested.

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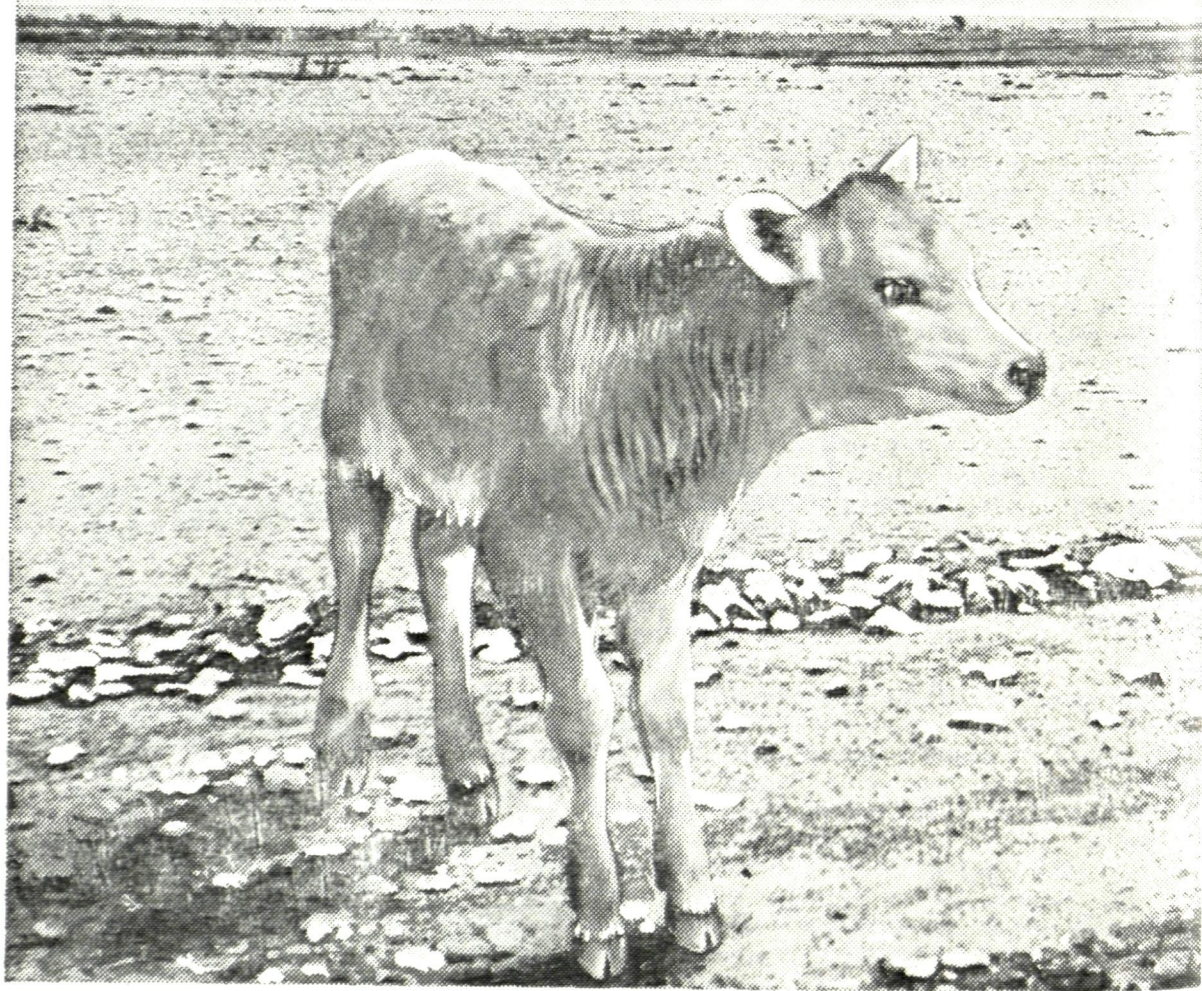
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