Weeds of Western Australia - Doublegee (Emex australis Steinh)

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DOUBLEGEE

(*Emex australis* Steinh.)

Introduced from South Africa as a vegetable in the early days of settlement, doublegee now occurs in most parts of the State. Besides causing injury to the hooves of animals it competes vigorously with crops and is difficult to control.
DOUBLEGEE
(Emex australis Steinh.)

There is no more troublesome weed in Western Australia than doublegee. Besides its competitive and smothering effect on crop and pasture, the spiny fruits penetrate the hoofs of stock causing lameness. It is a quick-growing annual which soon produces a strong taproot and forms seeds at an early stage of growth. Dormant seeds will continue to germinate for a number of years and a succession of germinations often occur in the one season. The seedlings are capable of surviving adverse conditions and making rapid recovery.

Doublegee, like a number of other serious weeds, is native to South Africa and was introduced to this State during the first years of settlement. 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 portions of the South-West. In the North-West it is mainly located along the rivers, but farther 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 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 in length and a long, thick taproot. The leaf blades, mainly two to three inches long, range from oval to triangular in shape and are on stalks of about the same length. The flowers are inconspicuous, but the fruits are very distinctive. They are woody, 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.
DOUBLEGEE

(Emex australis Steinh.)

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

(From a pen drawing by C. A. Gardner, Government Botanist.)
SIGNIFICANCE

Doublegee is not known to be poisonous but on the other hand is not relished by stock and usually is only eaten when grazed accidentally along with other herbage. It provides vigorous competition for 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 when involving 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 and there are now few districts in the State where it does not occur. Rubber-tyred 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.

Where only isolated plants are present, they should be grubbed and, if bearing seeds, destroyed by burning. 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 when 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, embodying for a number of years a two-year rotation of an early variety of wheat alternating with fallow. 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, including ley farming, is possible, the sowing of clovers and grasses, particularly subterranean clover, together with liberal dressings of superphosphate, have checked the growth of doublegee. Farmers prefer to leave heavily-infested land under clover for an extended period before cropping, as germination of the weed is stimulated as soon as the soil is worked.

The hormone-like herbicides have given such spectacular results with wild turnip and wild radish that their use for the control of doublegees is often under discussion. The habit of the plant, and the fact that it is an annual, gave reason to believe that it would be susceptible to moderate rates of application, and trials were commenced by the Department when the chemicals first became available several years ago. Unfortunately the doublegee belied its appearance and results have not been very encouraging.

Farmers have claimed varying degrees of success with use of different 2, 4-D formulations and some of our trials have caused a marked suppression of growth and in some cases a high degree of control. After many detailed investigations ex-
tending 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.

Although our work has been largely negative it has answered many questions and the experiments have been described in detail in the Journals of Agriculture July-August 1954 and March-April, 1955.

It is not intended to discontinue experimental work with this weed as there is every chance that a formulation will be produced having a greater lethal effect and penetrating capacity.

Results with Dinoc (30 per cent. sodium dinitro-ortho-cresylate) have already been recorded. 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. Firstly, the cost of chemical exceeds 30s. per acre and secondly, high volumes must be applied, calling for large quantities of water and making low-volume equipment unsuitable for application.

Other chemicals such as sodium chlorate and arsenic pentoxide can be used for the destruction of small patches of doublegees but are not selective in action and destroy other herbage. One pound of either substance should be dissolved in two gallons of water and applied in the form of a fine spray.

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 6oz. acid equivalent of the amine, and 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 an economical undertaking 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 to indicate that treatments are more effective in the northern portions 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.

Chemicals of the growth regulating or hormone-like group are continually being tested for herbicidal properties and it is possible that a formulation will be prepared that will prove effective against doublegees.

Biological control has been considered but there is little hope of success with this method.

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Last year, small paddocks were sown in rows in order to augment the supplies of seed to enable some distribution to take place, and also to give a demonstration of a method of seed production.

The Superintendent of Dairying (Mr. M. Cullity) now advises that small parcels can be made available to farmers who are interested in seed production. Successful applicants will be requested to plant the seed in spaced rows to allow inter-row cultivation, and to submit the areas sown for certification under the Departmental scheme. As limited supplies of seed only can be distributed, it is most desirable that applicants have the necessary cultural implements, and can arrange for the harvesting and threshing of the seed.

The maximum quantity of seed cannot be finally determined as yet, but it is unlikely that it will be more than sufficient for sowing five acres at 2 lb. per acre. Seed is priced at £1 per lb. Applications for seed should be addressed to the Superintendent of Dairying.

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