PENNISETUM MACROURUM

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Summary

Pennisetum macrourum (*Pennisetum macrourum*) is a rhizomatous perennial which, under favourable conditions, can form dense colonies five to six feet high. On the farm where the weed was first recorded, the infestation is now estimated to cover a total of 15 acres. Isolated patches are reported to occur over 4,000 acres. It spreads mainly by seed. *Pennisetum macrourum* has proved resistant to high rates of weedkillers in trials, and it is difficult to eradicate by cultivation on stony country. There are about forty known infestations throughout New Zealand, and one or two new infestations are being reported every year.

INTRODUCTION

Pennisetum macrourum (*Pennisetum macrourum*) is described in the *Grasses and Pastures of South Africa* as a densely tufted perennial with a stout, shortly creeping rhizome. In favourable conditions in Marlborough, it grows 5 to 6 ft high. It is widely distributed in its native habitat in the Southern Cape region of South Africa, and the central, northern and eastern Transvaal. It usually grows in wet places or on hillsides.

The first published record of *pennisetum macrourum* in New Zealand is to be found in a Department of Scientific and Industrial Research Bulletin prepared by Dr H. H. Allan, former Director of the Botany Division, in 1940. This referred to the infestation on a farm at Kaikoura, currently the largest area of *pennisetum macrourum* in the country. *Pennisetum* was planted as an ornamental at least twenty years previously. However, the time-lag between arrival and official recognition is not usually as long delayed as that.

Horticultural activities have undoubtedly been responsible for the introduction of many weeds into New Zealand. After the first specimen of *Centaurea macrocephala* was officially identified in New Zealand, enquiries revealed that the lady who was anxious to identify this unusual plant in her garden had obtained it in a "mystery packet" of seeds from a well-known firm of seedsmen in Palmerston North. In 1940, Dr Allan estimated that about 25%, or one-quarter, of the adventive flora of New Zealand owed their origin to horticultural activities, which in terms of species then meant about 300.

HISTORY OF THE FIRST REPORTED PLANTING

Pennisetum macrourum was one of those 300 plants. A. J. Healy, Assistant Director of the Botany Division, DSIR, has observed that most of the early identifications of *pennisetum macrourum* he made appeared

to follow in the footsteps of a landscape gardener. R. D. Andrew, the son of S. Andrew who owned the farm at Kaikoura at the time the *pennisetum macrourum* was planted, has provided some of the early details. Mr Andrew bought the farm called "Fernleigh" about 1905 or 1906. He was a keen horticulturalist and arranged for a well-known Christchurch nurseryman to landscape the area around the homestead. The planting of the homestead grounds went on for a number of years, but, by the time Mr Andrew was attending secondary school, most of the trees and shrubs were well established. This was in 1922.

The water supply to the homestead was pumped by a ram from the dam enclosure, as it was called. That used to be a good spring of clear water dammed by a concrete wall. The whole enclosure was fenced, and a number of trees were planted around the outside edge. Around the pond formed by the dam, a number of ornamental grasses, including *pennisetum macrourum*, had been planted. Mr Andrew thinks the plantings would have been done before 1920. The family left Kaikoura in 1926. At that time, the grasses round the dam would have been six to ten years old, and Mr Andrew was sure that there was then no problem of the weed spreading.

SPREAD OF *PENNISETUM MACROURUM* AT "FERNLEIGH"

Mr Andrew visited "Fernleigh" shortly after World War 2. *Pennisetum macrourum* had then extended several chains down the creek bed. There was also a small patch on the hillside. Thus, in the intervening twenty years, the spread of *pennisetum macrourum* was sufficient to cause concern, but was not unduly alarming.

However, in the following twenty years there was a marked increase. In 1966, a report on the infestation at "Fernleigh" was made by a party of four including Mr Healy. The report noted that the total area of the weed had grown to about 10 acres. Isolated patches were reported to occur over an area of 4,000 acres, between "Fernleigh" and the sea. Today, the present owner estimates the total area of *pennisetum macrourum* on his farm to be 15 acres. The hill behind the house is totally covered, and there are many patches in surrounding paddocks. Stock appear to be the main agent of spread, by disseminating seed.

The acreage given in 1966 and again this year is only an estimate, and the increase is probably less than the figures suggest. Of real concern is the reported spread of odd clumps of the weed to the banks of the Kowhai River and to a paddock adjacent to the Kahutara River. Immediately south of the Kahutara River lies steep, rough country. *Pennisetum macrourum* has followed the creek from "Fernleigh" to the sea, a distance of three miles in a straight line, and has done the same at Wharanui. Spread of seed by tidal currents is a possibility. In addition, *pennisetum macrourum* is growing adjacent to the railway line at Wharanui and near Blenheim. Conditions for further spread appear to be excellent.

Some plants can apparently be quite innocuous for years, and then, for reasons not always clear, suddenly explode. It is interesting to speculate on the possible reasons for this, as far as the *pennisetum macrourum* at "Fernleigh" is concerned. When Mr Andrew left "Fernleigh" the trees around the pond were well established. *Pennisetum macrourum*, a plant which has developed in the veld, the grassy plateaus of South Africa, dislikes shade. Penetration of *pennisetum macrourum* plants under the large deciduous trees at "Fernleigh", even adjacent to the original plant-

ing, is slight. The closer the approach to the trees, the smaller the plants become. In the case of a large oak almost surrounded by dense *pennisetum macrourum*, the nearest approach to the trunk is 16 ft. Round the points of the compass, the average distance from the trunk is 23 ft. Some plants which have been overgrown by scrub on the fringe of the main infestation appear quite dead. Others show a few spindly green stems. No seed-heads have been found on plants in shaded areas.

WAYS OF SPREADING

There are several means by which *pennisetum macrourum* can spread. The seed, surrounded by an arrowhead formation of bristly hairs, can be carried on fleeces and hairs of animals, by water in water races and creeks, and by wind for limited distances. It could also be carried in and on hooves of animals. The plant can also spread vegetatively by rhizomes washed away from colonies by floods in creeks. Thus it appears that, in a fenced-off area surrounded by trees, the only likely means of spread would be by water-borne seed. If the trees had cast sufficient shade, it is possible that viable seed would not be produced. Under such conditions, one could speculate that there would be no spread of the seed. However, remove the fence, or cut down a tree or two, and a new set of conditions would operate which could allow the weed to escape.

The potential seriousness of the weed lies in the comparative rapidity with which it can spread under favourable conditions and its deep-rooted rhizomatous character. This makes it very difficult to dig or grub out, because, like couch (*Agropyron repens*), every little bit of the rhizomatous root that is left can send up a fresh shoot. This also makes it very resistant to chemical control, since recovery of any small portion of the rhizome results in eventual plant recovery.

CONTROL BY CULTIVATION

The present owner of "Fernleigh" is at present cultivating a paddock which has two or three small patches of *pennisetum macrourum*. Its history is from pasture to turnips to green feed oats and now fallow. It has been ploughed twice, and, in an effort to control docks (*Rumex* spp.), has been grubbed six or seven times. Because of the stony nature of the soil, penetration by grubbers is limited. This perhaps accounts in part for the fact that all the cultivations have so far had little effect on *pennisetum macrourum*. Where no stones are present, a cropping programme combined with deep grubbing would probably eliminate the weed from a paddock. But it presents a very real danger where deep and regular cultivation cannot be carried out.

OFFICIAL ACTION

The potential seriousness of *pennisetum macrourum* was recognized not long after it was first officially identified. In a report to the Plant Research Committee (which included three members of the Department of Agriculture) in 1944, Mr Healy said "Some action towards control should be instituted." In that report, six new localities where the weed had been identified were mentioned.

In 1955, the Minister of Agriculture (K. J. Holyoake), issued a special statement to the effect that it was proposed to set up a special mobile gang for the control of certain weeds, those named being water hyacinth

(*Eichhornia crassipes*), Cape tulip (*Homeria breyniana*), pennisetum macrourum, and Russian knapweed (*Centaurea repens*). Russian knapweed was restricted to an area of about an acre not far from Blenheim, and has been disposed of following successive treatments with the ureas and other weedkillers. Pennisetum macrourum continues to flourish unmolested.

In 1960, in an article in which he described the successful treatment of a small infestation of pennisetum macrourum in the Rangitikei district with monuron, A. Booth, then Farm Advisory Officer, Wanganui, mentioned 26 sites from Dargaville to the Clutha River where the weed had been identified. Since then there have been at least another 15 sites located. Mr Booth gave the following warning about the weed: "Once it becomes established over large areas, eradication is extremely difficult and the cost of materials prohibitive. Positive action now could save expensive and time-consuming control measures later." His warning hardly needs emphasizing. If eradication measures were started today, they would still be 20 years later than they should have been, if Mr Healy's original recommendation had been followed. Every year's delay is going to add appreciably to the eventual cost of eradication. We should press for action to be taken while the cost can still be counted in thousands of dollars, rather than tens of thousands.

RECOMMENDATIONS FOR CONTROL

It is difficult to make recommendations for control of the weed, considering that only limited success has been achieved. However, this should be attempted. Recommendations are based on the trial work that has been done, and on the results achieved by contractors and weeds inspectors, and the advice of specialists.

(1) For areas of dense infestation greater than an acre or so, tree planting appears to be the easiest and most economic method of control. An area can be planted in pines for an inclusive cost of about \$50 per acre. A completely closed forest canopy can be achieved in about six years.

(2) For smaller areas of fairly dense infestation, 2,2-DPA still appears to be the most suitable chemical. The fact that it is now cheaper than TCA also makes it economically attractive. For such areas the following programme is suggested.

- (a) Graze or burn off the pennisetum macrourum so that it is at a manageable height of 2 to 3 ft for spraying. Spray from January to April.
- (b) Apply 60 lb 2,2-DPA in sufficient water to thoroughly wet the foliage. This will probably be not less than 40 gal.
- (c) A year later apply a further 60 lb of 2,2-DPA.
- (d) Seed and superphosphate should be applied six to eight weeks after spraying.
- (e) A year after the second spraying, a careful examination of the area should be carried out. If there are few surviving plants and no signs of shoots developing below ground level, spot treatment can be applied at the same equivalent rate (60 lb of 2,2-DPA).
- (f) Plants surviving that treatment can be either dug out or spot treated with bromacil at a rate of 40 to 60 lb.

(3) For individual plants or small clumps, graze or burn as before, and treat with bromacil at 40 to 60 lb. Bromacil is best applied when the soil is moist and there is likelihood of further rain to carry the chemical into the root zone. A good sward should be established as soon as possible after all treatments, to discourage the germination of possibly viable seed in the soil.

There are reliable reports from two sources of control of pennisetum macrourum with amitrole-T, but one failure has been seen. However, reports are encouraging, and will certainly be followed up by trials in spring.

It should be emphasized that similar treatments to those suggested (under 2(c) above) have given a high degree of control, but not eradication. Final eradication will depend on appropriate action taken in repeated visits to sites of infestation over a period of years. This will not be cheap, but should be done.

SITES OF INFESTATIONS

Sites of known infestations of pennisetum macrourum are at Dargaville, Ruawai, Aratapu, Glinkes Gully, Te Kopuru, Waipawa, Epsom, Pipiroa, Rotorua, Opotiki, Mourea, Dannevirke, Hunterville, Kauangaroa, Kairanga, Vernon, Wharanui, Culverden, Omihi, Wairau, Brighton, Lincoln, Westport, Methven, Rakaia, and Clutha River. More recent identifications have been reported from Waiuku, Havelock North, Umutaroa, Pirinoa, Te Kuiti, Wangachu, Lake Rotoehu, Heme Gorge, Cheviot, Cust, Rangiora, Leithfield, Lower Heathcote, Oxford, between Leeston and Rakaia, Chertsey, Racecourse Hill, Greenpark, Seafeld and Geraldine.

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