THE CONTROL OF CUTTY GRASS (*Carex* Spp.)

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SUMMARY

In trials MCPA proved superior on a cost efficiency basis to MCPB, 2,4-D, 2-4-DB, or dalapon in controlling cutty grass (*Carex* spp.) with a strong creeping rhizome system.

In field spraying by farmers results varied from poor to excellent due to a variable amount of regrowth from crown rhizome tissue.

Translocation of MCPA is efficient. All the apical buds of horizontal rhizomes and the majority of the crown buds were killed.

MCPA at 2 lb acid equivalent per acre applied during December-January with a spray gun at about 120 gallons of spray mix or by boom at 30 gallons or more will prevent the spread of cutty grass patches. Suitably timed respraying may give complete control.

Cutty grass is a term applied to a number of different plants characterised by long, relatively broad, grass-like leaves with rough margins and in some cases rough leaf ribs. The true grasses pampas grass (*Cortaderia dioca*) and toetoe (*Arundo conspicua*) as well as a number of species of the genus *Carex* have these characteristics and are often called cutty grass. This paper outlines the growth habit and ecology and observations with respect to the control of plants falling within the range of the species *Carex ternaria* as interpreted by Cheeseman (1) and followed by authors describing New Zealand vegetation. Recently Hamlin (2) has revised the classification of the native members of the genus *Carex* and distributed the varieties previously known as *C. ternaria* among three other species, *C. lessoniana* Steud., *C. geminata* Schk., and *C. coriacea* Hamlin. The cutty grass most common in the Canterbury trial localities is *C. lessoniana*, while the one most common in Southland and referred to as *C. ternaria* var. *gracilis* by Fitzgerald (3) does not fall clearly into any one of Hamlin's three species. However, the growth form and habitat descriptions recorded here appear to apply to the group as a whole and variations of characters of possible taxonomic value met with so far do not seem to correspond with any marked differences in reaction to chemicals. No work has been carried out in the *Carex* species with a non-creeping growth form such as the Longwood tussock (*Carex comans*).

Growth Form of Cutty Grass

Cutty grass is characterised by tufts of coarse grass-like foliage, often aggregated into dense patches to the exclusion of all other growth. The leaves have three ribs and a marked longitudinal groove, and vary from about 3/16 to 5/8 in. in width and 1 to 5 ft in length, depending on variety and environment. The margins and back of the mid rib are armed with small tough, forward-pointing projections which cut if the leaf is drawn through the hand. The flower stem is triangular in section and bears greenish to brown catkin-like spikelets on fine peduncles arising from the axils of long leaf-like bracts. The stem, apart from the flowering stem, is a stout rhizome about 1/4 in. in diameter with brown sheathing scale leaves, or a fibrous wrapping of the tattered remnants of the scale leaves. The distance between nodes is commonly about 1/2 in. The mature rhizomes are very wiry with a spongy cortex and may become densely interlaced in old colonies. Roots are produced at the base of the crowns only and not at all nodes as in the case of twitch grasses.

Vegetative Growth Cycle

Tufts of leaves live one to two years. In some cases all the foliage is killed by winter frosts, while in others tufts produced in the current season survive the winter, often taking reddish brown tints in autumn and winter. Fresh tufts arise either from crown buds produced at the base of mature tufts or from the terminal buds of creeping rhizomes. Actually two types of

Carex geminata, showing growth form of cutty grass. Two crowns are connected by a short horizontal rhizome. Two new horizontal rhizomes are developing. Crown buds do not show clearly.

branching occur at the crown, namely, short vertical branches and horizontal branches from a few inches to several feet in length. Roots arise at the junction of the branches and the crown region can become a dense mass of stubby branches, wiry roots, and fibrous leaf bases, underlain by a tangle of creeping or horizontal rhizomes.

The creeping rhizome bud is protected by a sharp pointed sheath of scale leaves and when growing in a horizontal position is similar in diameter to the rest of the rhizome, but undergoes a marked change as soon as it curves upward toward the surface. It swells considerably, internodes do not elongate, true leaves are formed, and roots emerge at the base of the swelling. Soon after the shoot appears above ground, fresh buds start forming in the swollen crown zone. This cycle of shoot development goes on continuously in some habitats, though it is at its peak during spring and summer and slows down in autumn and winter, while in others it comes to a standstill in winter.

Reproduction of Cutty Grass

Cutty grass grows readily from seed in river silt, but establishment from seed in pasture has not been studied. Spread from place to place by transport of pieces of rhizome also occurs. In this respect it is interesting to note that fresh shoots normally arise from pieces of crown and very rarely from the nodes of the horizontal rhizome.

Habitat

In the native state cutty grass colonises damp though reasonably drained silty hollows in the flood plains of streams and damp hollows behind and among coastal sand dunes. Its tufted habit collects sand and silt from river flooding and wind blow and together with the rhizomatous habit suits it to survive and spread in these conditions.

Opening up the country for farming has made more sites available for colonisation. This is especially the case in Southland where considerable areas of peaty soils and low-lying partly swampy country are infested. Gully floors, seepage areas, and drain banks are other favoured localities.

The Cutty Grass Problem

The coarse rough foliage is not attractive to stock, though cattle and sheep will eat it under heavy grazing, especially in autumn. In spring and summer, however, it is usually left in favour of more palatable pasture species and the foliage grows unchecked to form, in heavy infestations, a blanket choking out all other vegetation. Ploughing is difficult because of the tough mat of rhizomes, and cultivation favours the cutty grass unless all the rhizomes are killed before the area is sown down again. Some sites cannot be ploughed and it is often not expedient to plough a whole field to deal with patches. Rhizomes and foliage block open drains and rhizomes and roots choke tile drains impeding drainage and favouring the spread of cutty grass. A chemical method of control would thus be very acceptable.

Review of Literature

Fitzgerald (3) has reported control trials on cutty grass in drains and indicated that 20 lb of dalapon applied in June gave 100 per cent control for at least six months.

In overseas literature passing reference only has been found to species of *Carex* as members of the weed population in trial areas. On the other hand there is a voluminous literature relating to the control of another sedge, nutgrass (*Cyperus rotundus*). Here 2,4-D at 3 lb per acre will kill the top growth and attached tuber, but regrowth takes place from dormant tubers (4). Pfeiffer and Burleigh (5) reported better top kill of nutgrass with MCPA than with 2,4-D.

Chemical Control Trials

In mid December 1954 small plots were sprayed in cutty grass patches growing in pasture on a peaty sandy soil in the Spencerville district, near Christchurch. Two treatments were used.

- (1) The butyl ester of 2,4,5-T at 2 lb acid equivalent per acre.

- (2) Mixed sodium and potassium salts of MCPA at $1\frac{1}{2}$ lb acid equivalent per acre.

A knapsack sprayer was used and the plots sprayed with the equivalent of 100 gallons of spray mix per acre.

The sprayed plants slowly developed autumn tints in the foliage (most marked with 2,4,5-T plots). Cattle were grazing the area and in autumn they ate the sprayed and unsprayed foliage to ground level. In the following December only one or two shoots were present on the plots, representing a 95 per cent or better kill when compared with the shoot density in the unsprayed area. No further regrowth occurred throughout the season.

In January and February of 1958 plots were laid down by Messrs C. Saunders and D. McLean in Aranui and Spencerville, using the Chesterford Park logarithmic sprayer mounted on a Department of Agriculture "Land-rover". This machine sprayed a swathe 14 ft wide and applied the spray solution at 32.6 gallons per acre and 40 p.s.i pressure. Plots were about 30 yds long. In this type of machine the spray solution is continuously and uniformly diluted by a quantity of water equal to the amount of spray solution pumped out of the nozzles. The consequence in the case of this machine was that the quantity of weed control chemical applied fell by half for every 6.35 yds of travel. The rates given below are the starting concentrations, and the object of the trials to find the optimum rate per acre for control. 2,4,5-T, though effective in the first trial, was not included due to its known adverse effect on clovers and relative cost.

1. Mixed sodium and potassium salts of MCPA at 6.25 lb acid equivalent per acre.
2. The butyl ester of MCPA at 6.25 and 12.5 lb acid equivalent per acre.
3. The sodium salt of MCPB at 6.25 lb and 7.5 lb acid equivalent per acre.
4. The butyl ester of 2,4-D at 6.25 lb acid equivalent per acre.
5. The sodium salt of 2,4-DB at 6.25 lb acid equivalent per acre.
6. The triethanolamine salt of 2,4-D at 6.25 lb per acre.
7. Mixed sodium salts of MCPA and 2,3,6-TBA at 6.25 lb of the mixture.
8. Dalapon at 50.6 lb per acre.

Browning of the foliage took place on all treatments, but was most marked on plots treated with dalapon and the butyl ester of 2,4-D and least on the 2,4-DB plots. Both areas were grazed; by dairy cows on the somewhat swampy Aranui paddocks and by dry dairy stock at Spencerville.

At Aranui observations in 1959 showed that on plots treated with MCPA the control was excellent above 2 lb acid equivalent per acre and was detectable visually down to 1 lb acid equivalent per acre.

On the 2,4-D and 2,4-DB plots some regrowth occurred even at the highest rate, but 90 per cent control extended to between $2\frac{1}{2}$ to 3 lb acid equivalent per acre. Dalapon gave 90 per cent control down to $12\frac{1}{2}$ lb per acre, but grasses and clovers had been eliminated and the space occupied by a dense mat of plantain. By contrast the hormone treated plots were well covered with grass. At the point of optimum control, clover was absent in the mixed MCPA-TCB plots, very sparse in the 2,4-D plots, about 25 per cent less in ground cover on the MCPA plots and unaffected on the 2,4-DB and MCPB plots. Results at Spencerville were similar but not so clear cut due to more regrowth in one part of the field and partial dying out of the cutty grass in another part. This latter effect continued through the summer of 1959-60 with the result that there is now very little cutty grass on one half of the field and considerably less than formerly on the other half. Partial dying out has also occurred at Aranui. This is attributed in part to the drought conditions which have prevailed in the last two summers combined with consolidation due to heavy stocking.

From these trials MCPA was considered the most promising chemical, since at effective dosage rates it was: (a) considerably cheaper than dalapon and did not damage the grasses; (b) cheaper and less damaging to clovers than 2,4-D; (c) cheaper than MCPB and under moist soil not so much more drastic on clovers as to warrant using the dearer chemical.

Field Scale Spraying

Over the past two years a number of farmers have sprayed cutty grass with MCPA at 2 lb acid equivalent per acre either with a boom at 20 to 30 gallons per acre or with a spray gun at about 120 gallons of spray mix per acre. Mr W. Littlejohn has kept these areas under observation and supplied progress reports of the effects. Results so far have varied from poor to excellent in the farmer's estimate. The course followed is a slow dying of the sprayed foliage followed by a variable amount of regrowth the following season. Appearance of regrowth may be delayed until December or later, but it establishes very rapidly once it appears. Gun spraying has proved more satisfactory than boom spraying and December-early January spraying the best time.

Effect of MCPA on Cutty Grass Rhizomes

The slow death of the foliage accompanied by the appearance of autumn colouration has been noted. The following information with respect to the rhizome was obtained by digging at the edges and in the centres of sprayed and unsprayed patches.

- (1) MCPA translocated very efficiently from the foliage to developing buds and especially along the developing horizontal rhizomes. Growth was arrested and all horizontal rhizome buds and most crown buds were found to be dead at the end of the season of spraying.
- (2) The buds producing the current year's foliage had been killed.
- (3) The tissue of the horizontal rhizome connecting established crowns appears to stay alive for some months at least after the foliage has been killed by chemicals or has died from natural causes. This also applies to the complex of short branches comprising the crowns.
- (4) Regrowth occurs either from crown buds which have survived the spray or from fresh buds formed on the surviving crown rhizome tissue mentioned in item three above.

DISCUSSION

The promise from the first trials of good kills has not been borne out uniformly in practice. This seems to stem from the fact that all stages of rhizome development from growth to senescence occur within the cutty grass colony. Translocation is markedly to growing points, and mature and senescent tissue is often not killed. Poor results I believe have been due largely to failure to pursue effective follow-up treatment. The problem still is to develop such treatment. A chemical is required which will persist in the mature rhizome tissue sufficiently long to prevent new buds forming. In view of the slow death of the foliage after spraying, repeat applications of MCPA in the same season may achieve this result. Alternatively, respraying the following summer when the regrowth has had time to emerge may prove effective. Both courses are being tried but results will not be available until next year.

Since cutty grass prefers moist soils, the drainage of infested areas should be looked at, while indications are that compaction by stock trampling is beneficial in open soils. Attention to such details of management combined with MCPA spraying can prevent the spread of, and eventually, I believe, kill out, cutty grass in pasture.

REFERENCES

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- 2a. Hamlin, B. G., 1954. Studies in the New Zealand Carices 1, Transactions of the Royal Society of New Zealand. Vol. 82, 1, pp. 49-64.
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3. Fitzgerald, J. N. 1956. Weed Control in Drains. Proceedings of the Ninth New Zealand Weed Control Conference, pp. 115-118.
4. Samper, E. R., and Melville, G. 1956. Studies on the control of Nutgrass (*C. rotundus*). Proceedings of the Southern Weed Conference 9th Annual Meeting, pp. 220-224.
5. Pfeiffer, R. K., and Burleigh, R. J. F. 1958. Experimental results of Selective Weed Control in Sorghum (*Dura*) with MCPA and 2,4-D in the Sudan. African Weed Control Conference Proceedings, pp. 86-91.

6. Hamlin, B. G. Private communication. A Southland specimen identified as a form of *C. coriacea*.

DISCUSSION

Q.—Would the speaker give the rate of MCPA comparable to 12 lb of dalapon?

A.—Approximately 12½ to 15 lb of dalapon gives a comparable kill to 2 lb acid equivalent of MCPA.

Q.—Does drainage play a part? Could not a lower rate of dalapon and amitrol or MCPA be possible with drainage and the follow-up treatment of pasture renewal?

A.—Cutty grass will persist after drainage, requiring either thorough cultivation or use of chemicals.

Q.—Has the speaker considered using low rates dalapon plus burning? We have had success with this, but find it should be inclusive of oversowing.

A.—Repeat sprayings are required; burning may help to remove growth.

Q.—Has the speaker used any wetting agents, as I have found they give improved results with MCPA and dalapon?

A.—No.

Q.—Is not chemical control of rhizomatous *Carex* improved if sprayed areas are subsequently cultivated?

A.—Cultivation in conjunction with spraying is not acceptable, because associated pastures are destroyed.

Q.—Have you any experience in keeping top growth off cutty grass? In Southland we have had experience in winter burning. By spring the cutty grass is not a problem. Continuation of this can give control.

A.—I agree. Where it is stocked heavily enough it has been controlled.