NEW ASPECTS OF CHEMICAL CONTROL OF WEEDS IN DRAINS

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INTRODUCTION

In a previous paper I have mentioned the inadequacy of mechanical cleaning of drains. Drains cleaned thoroughly in autumn may be completely choked up by the following spring and because of this it is usual on the Hauraki Plains, at least, to carry out a second clean in early spring. Even so there are varying degrees of growth between these two periods so that efficient drainage is very fleeting indeed.

Uninhibited flow of water assumes tremendous importance on areas such as the Hauraki Plains because the flow is already very sluggish due to the almost complete absence of fall in the land. It is also important because flood gate action may be restricted to as little as four hours daily. It has now assumed a new importance on the Hauraki Plains in keeping feeder drains open which service the many large pumps which have been installed in recent years by the Catchment Board. During a recent flood these feeder drains failed to keep the water up to the pumps, the drains having fallen below design capacity due largely to the heavy weed growth.

A further problem created by mechanical cleaning methods is that many drains are increasing in size beyond the required capacity and the continuous dumping of spoil on paddocks and roadsides is creating difficulties. Of course the use of chemicals would not obviate all mechanical and hand cleaning since some silting of the bottom of the drain would be inevitable, but the number of such cleanings would be reduced from two annually to one perhaps every three or four years. A drain free of weed growth is, of course, less likely to silt up so rapidly.

In my earlier paper a large number of chemicals was listed which had been tried out for weed control in drains and as a result of continuing work it is now clear which are the most useful ones. No single chemical has proved entirely satisfactory on its own. When one weed is killed out it is common for another to take its place or certain weeds are resistant to a chemical so that a combination of chemicals may be necessary.

There are two main lines of approach.

1. SOIL STERILISATION

In my previous paper I was very enthusiastic about the substituted urea compounds which at that time appeared extremely promising. The bottoms of drains treated with monuron did remain free of weed growth for up to three years and some very difficult weeds were controlled by this chemical, but it has some serious limitations. Its most serious limitation is that it is not as effective against growth on the sides of drains as it is on the bottom growth. Though very much improved drainage is provided, results fall short of the ideal and a mechanical clean of the sides is still required.

A further serious limitation is that application of the weedicide must be carried out when the drain is dried out during the summer months. As the larger communal drains, such as those usually controlled by drainage boards, may not dry out at any stage of the year, soil sterilisation can be out of the question. The substituted urea compounds also fail to control paspalum (*Paspalum dilatatum*) and plantains (*Plantago* spp.). Floating sweet grass (*Glyceria fluitans*) may also thrive in the spring months anchored to the side of the drain but floating well clear of the sterilised bottom. To all these limitations must be added the high cost of sterilisation with this chemical, 4s. per chain per yard of width treated, assuming an application rate of 20 lb of monuron per acre.

2. TREATMENT OF EMERGENT WEEDS

Because of the permanent water problem chemicals suitable for spraying emergent growth, namely dalapon, amitrol, and 2,4-D, are especially useful and can apparently be combined very successfully. For most conditions a mixture of dalapon and amitrol is very successful, but where watercress (*Nasturtium officinale*), buttercup (*Ranunculus* spp.), rush (*Juncus* spp.), or convolvulus (*Convolvulus arvensis*) is present the 2,4-D should be included.

It has been stated that dalapon and phenoxyacetics are antagonistic to one another, unless the rate of dalapon is very high and the rate of phenoxyacetic acid very low. Admittedly there is some slight precipitation when these two are mixed, but in practice this appears to be of little consequence where feed back from the pump is used to agitate the mixture.

RATES OF APPLICATION

Trials have indicated that 10 lb of dalapon and 5 lb of amitrol per acre will control the most resistant grasses such as reed sweetgrass (*Glyceria maxima*), paspalum, and tall fescue (*Festuca arundinacea*) but where such grasses are absent the rates of dalapon and amitrol can be halved. Indeed the Hauraki West Drainage Board is employing rates as low as 2 lb of dalapon and 2 lb of amitrol per acre with amazingly satisfactory results.

Where 2,4-D is included in the mixture the ethyl ester has been used at the rate of 2 lb of acid equivalent per acre.

TIME OF APPLICATION

The time of application is very critical with certain weeds. A time of application trial has been carried out on floating sweetgrass, the chemical being applied at monthly intervals from July, when this weed commences active growth, until October when it reaches maximum growth. Excellent control was obtained at all stages, though the August treatment was the most useful. The July treatment succeeded in controlling the existing growth, but naturally failed to control plants which developed after the spray was applied. Treatments later than August were less useful because the drains were already choked with growth to a point where water flow was seriously impeded. The spraying of floating sweetgrass in autumn is out of the question because it is apparently an annual which does not re-establish itself until the early winter.

Earlier trials indicated that reed sweetgrass could be controlled by autumn spraying whereas spring spraying was quite ineffective. A time of application trial was commenced on reed sweetgrass last October, the chemical being applied at monthly intervals. This trial is not yet completed, but results to date indicate that treatments before February are completely unsuccessful, while those from February onward, until the end of May at least, are most successful. To play safe it would be as well to spray in the latter half of February rather than in the early part.

From the work of the Hauraki West Drainage Board it is clear that in drains free from reed sweetgrass initial sprayings should be carried out in early spring. This results in control of growth at a critical time in so far as drainage is concerned, while a further follow-up spraying in autumn ensures a clear waterway for winter.

Where there is heavy growth of weeds such as raupo (*Typha angustifolia*) in a drain, spraying **after** December will not entirely eliminate the necessity for some hand cleaning in autumn, because insufficient time is available for complete decomposition of the growth. Even in a December spraying a little hand cleaning may be necessary. As an example a drain in the drainage board area which normally takes three men three weeks to hand clean, after spraying last December was cleaned during the following April in two days. The work in April consisted of the removal of dead growth only.

WEEDS CONTROLLED

Each district will have a set of weeds peculiar to the drains in that area. Weeds successfully controlled on the Hauraki Plains include the following:

Purua grass (*Scirpus maritimus*)
Raupo (*Typha angustifolia*)
Reed sweetgrass (*Glyceria maxima*)
Floating sweetgrass (*Glyceria fluitans*)
Creeping bent (*Agrostis stolonifera*)
Mercer grass (*Paspalum distichum*)
Tall fescue (*Festuca arundinacea*)
Yorkshire fog (*Holcus lanatus*)
Cocksfoot (*Dactylis glomerata*)
Button weed (*Cotula coronopifolia*)
Watercress (*Nasturtium officinale*)
Plantain (*Plantago species*)
Docks (*Rumex species*)
Convolvulus (*Convolvulus arvensis*)
Rough-stalked meadow grass (*Poa trivialis*)

When one weed is killed out another may crop up to take its place. An example of this is the sudden appearance of the weed starwort (*Callitriche verna*). The bulk of the leaves of this plant are under the water while the upper leaves form a rosette and float on the surface of the water. It is probable that this will be killed out by the spring spraying, but I mention it as an example of the kind of sequence which can take place.

WORK OF THE HAURAKI WEST DRAINAGE BOARD

This board sprayed two-thirds of its drains last season and is extremely enthusiastic about the results.

Normally, in addition to a permanent staff of three men forty contractors are employed each autumn on drain cleaning. Last season, however, the permanent staff was increased to six, while the number of contractors employed was reduced to four only, and those were employed on one drain which had not been sprayed.

A canal which comes under the jurisdiction of this board normally costing £500 per annum for dragline cleaning was sprayed last autumn for £70. In addition to a tremendous reduction in costs more efficient drainage is also being provided due to the almost complete absence of weed regrowth.

A feature of the board's work is the extremely low rates of weedicide which have been used, the mixture being 2 lb of dalapon, 2 lb of amitrol, the ethyl ester of 2,4-D at 2 lb acid equivalent per acre, 3 pints of "Teepol", and 60 gallons of water per acre. The "Teepol" has been added as a wetting agent, but it is not known whether it plays a useful role.

Application of the weedicide is made with a specially fitted tractor, spray booms being rigged on either side to enable spraying to be carried out in both directions of travel, while a pump operating at 250 lb per square inch and a 200 gallon tank are set up on a trailer drawn behind. The spray boom is fitted with "Pope" butterfly sprinklers mounted on the underside of the boom at 2 ft 3 in. spacings, the number being increased or decreased according to the width of the drain to be sprayed. The orifice of each sprinkler is closed down to one sixteenth of an inch diameter by the insertion of an appropriate "Century" nozzle tip into the attachment socket of the sprinkler. With this arrangement the spray is thrown well down into the drain and an excellent cover is achieved.

Up to two miles of drain can be sprayed per hour with this set up, which based on a cost of £3 per hour for tractor and driver results in an application cost of £1 10s. per mile. The total cost of material as applied by the drainage board plus cost of application is about £6 per acre or

sixpence per chain per yard of drain width treated, so that several sprayings can be carried out for the cost of one mechanical cleaning.

Last April the Hauraki Plains were subjected to the heaviest rainfall on record. This caught one or two drainage boards unprepared, as they had not commenced their autumn drain-cleaning work and flooding resulted. However, practically no flooding occurred in the area controlled by the Hauraki West Drainage Board. The chairman of the board attributed this to the work done with chemicals.

CONCLUSION

We now have a remarkably effective range of weedicides for complementing the work of the mechanical drain cleaner. By their use we cannot fail to increase drainage efficiency and reduce drain maintenance costs to a fraction of their former level.