WEED CONTROL IN DRAINS

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OPEN drains to be effective require to be cleaned of weed growth twice annually. In some areas one cleaning in autumn is sufficient; on the Hauraki Plains, however, where the fall in the drains may be no more than 1 in 1000, a second cleaning in spring is usually considered to be necessary. Three seasons past exceptionally heavy rain in November in this area led to widespread flooding and consequent pasture damage. The cause of this flooding undoubtedly was partly the result of failure to deal with winter and spring growth in the drains, which in this particular season had been unusually heavy.

Drainage boards and farmers are faced then with a fearful problem, especially as it is becoming increasingly difficult to obtain labour to do this drain cleaning work at a reasonable price. The cost of this labour has now reached the stage where weedicides have a fair chance of competing economically. Drainage board officers contend that a cost of 3/6 per chain would compete successfully with hand cleaning methods. Trials to date indicate that this is not an impossibility.

Mechanical drain cleaning machines are coming on to the market, but so far they all have the disadvantage that, one, fence has to be taken down for them to operate. Secondly, they share the disadvantage of hand cleaning methods that in order to clean off weeds satisfactorily a certain amount of soil must be removed. This leads to the gradual enlarging of a drain beyond normal requirements.

NATURE OF GROWTH

1. Purua grass (*Scirpus maritimus*) is one of the worst weeds of the larger drains. This is a large sedge-like plant with bulbous roots, which starts its growth in autumn and browns off in summer, leaving the drain in a choked condition. Growth following hand cleaning in autumn is extremely rapid.

2. Reed sweet grass (*Glyceria maxima*): This is also a weed of the larger canals and drains and involves the expenditure of thousands of pounds annually on dragline work. This weed rapidly forms a raft across waterways in a manner similar to water hyacinth and encourages the deposition of silt.

3. Raupo (*Typha angustifolia*): This is also a weed of the larger drains and very often grows in association with purua grass. It also makes very heavy growth, reaching full development during summer.

4. Floating sweet grass (*Glyceria fluitans*), creeping bent (*Agrostis stolonifera*), mercer grass (*Paspalum distichum*), tall fescue, cocksfoot, Yorkshire fog, and paspalum are among the main grass weeds which have to be dealt with and are responsible for most of the growth in the smaller farm drains.

5. Plantain, docks, and sometimes convolvulus can very often prove a problem, especially after the grassy weeds have been cleared in spring.

Weedicides employed in trials on Hauraki Plains have been:—

Chlorinated benzene	CMU	Borascu
Atlacide	Arsenicals	TCA
Creosote	Sodium chlorate	Polyborchlorate

RESULTS OF TRIALS

1. Chlorinated benzene marketed under the trade name of "Benochlor"

Recommendations for use of this material are for the injection of the emulsion into the stream or drain at rates up to 8 gallons for every cusec, the material to be applied over a period of an hour or more.

A trial on *Glyceria maxima* resulted in the kill of a narrow band of the weed down the centre of the canal only, corresponding to the portion of the drain where the water was actually flowing. The problem still remains of how to get the emulsion to disperse through the tangled mass of growth and costs are such that the material could not be regarded as promising.

"Benochlor" employed as an aerial spray produced only a temporary scorching of the foliage, followed later by vigorous regrowth.

2. Sodium chlorate and Atlacide

A number of trials have been carried out on *Glyceria maxima*, employing rates from 150lb. per acre to 800lb. per acre. These trials showed that glyceria could be killed by an application of approximately 400lb. of chlorate per acre, provided the weed was growing on dry ground. Where the glyceria was submerged in water or where the ground was at all waterlogged the chlorate was quite ineffective. Since many drains dry out completely during summer chlorates can be used under these conditions for eradication of *Glyceria maxima*.

Four trials have been carried out in farm drains employing chlorates at 500lb. to 1000lb. per acre. The chlorate was applied as a spray, the applications being made at the beginning of the dry season in each case. Both rates of application resulted in a complete kill of docks, plantain, and all grasses except paspalum for a period of up to 6 months. In the case of purua grass the foliage was completely browned off, but new shoots appeared within 4 months.

Sodium chlorate or Atlacide on general grass and weed growth will produce results equal to or better than could be obtained with the shovel at a cost for material of approximately 2/6 per chain yard. The chlorates have the added advantage that they assist the burning of the dead foliage where it is desired to carry out such an operation. They have the disadvantage that their effect does not persist satisfactorily into spring and a second application is not possible at this time because of the water in the drains.

3. Borascu

This material was included in two trials dealing with a mixed growth at the rate of 1000lb. per acre. It proved so completely ineffective that at no period was it easy to pick the treated areas from the untreated control areas.

4. TCA

TCA was employed in three different trials at rates ranging from 50lb. to 250lb. per acre. For application the chemical was dissolved in water at the rate of 1lb. of TCA to 1 gallon of water.

The effect on tall fescue and paspalum was to retard their growth, the effect increasing with the application rate. A complete kill of all the other grassy weeds was obtained, even at the lowest application rate.

In the case of purua grass the top growth only was killed, new shoots coming away from the bulbs after 6 months. Clover, docks, and plantain, although slightly affected, soon recovered and grew strongly in the absence of competition by the grassy weeds.

So far no trials have been carried out to ascertain the effect of TCA on *Glyceria maxima*.

5. Creosote

Because some farmers claimed good results from the use of this material, it was included in two trials at the rate of 110 gallons per acre. A very rapid brown off of old growth resulted, followed by equally rapid regrowth. The temporary setback to the grasses enabled the plantain and docks to make greater growth than was the case on the control areas.

6. CMU

It has been claimed that the discovery of urea compounds with weed-killing properties is probably the most outstanding development since the introduction of hormone weedkillers. I firmly believe this is correct. They differ from all other soil sterilants in that they are relatively insoluble and so do not leach out of the soil rapidly.

In two trials in which CMU was applied nearly 18 months ago at the rate of 80lb. per acre there is no regrowth of any weeds except plantain, which is apparently resistant. Even the bulbous purua grass was killed, with the exception of a few isolated bulbs which appear to have escaped. The fact that the plantain was not controlled is not serious since this can be readily handled with 2,4-D. There is no doubt in my mind that the urea compounds, especially CMU, and the less soluble DCMU, will spell a new era in drain cleaning as soon as their price drops a little. The present cost, of approximately 10s. per chain yard, may appear high, but when it is considered that results may last for a period of 3 years, replacing 6 half-yearly drain cleanings by orthodox methods, then costs become very reasonable. So far no trial has been carried out on *Glyceria maxima*. It is quite probable that further trials will establish the possibility of reducing the application rate. In a trial carried out at the Invermay Research Station application rates of 30lb. and 60lb. of CMU per acre gave a satisfactory kill of floating sweet grass, there being no sign of regrowth after 8 months.

7. Polyborchlorate

This weedicide was incorporated in two trials dealing with mixed weed growth in one case and purua grass in the other. Polyborchlorate and Atlacide produced identical results when both were applied as a spray at 1000lb. per acre. In view of the greater cost of polyborchlorate I feel that no further consideration need be given this material for drain cleaning work.

8. Arsenicals

Arsenite of soda is the form in which the poison is commonly used. There are numerous proprietary arsenical mixtures on the market the majority of which contain 4 to 7lb. of arsenious oxide per gallon, present as arsenite of soda. A wetting agent is invariably incorporated. Those who wish to make up the spray themselves will find the following formula useful:—

White arsenic, 1lb.
Washing soda, 1lb. or caustic soda, ½lb.
Water, 4 gallons.

The soda is first dissolved in a convenient amount of water, using heat to hasten the process. Slowly add the arsenic (which has previously been made into thin paste), stirring all the time, and place on a strong fire. After it has come to the boil allow it to remain boiling for ½ hour. Avoid fumes when boiling. The remainder of water is added to make the required bulk.

The following example will give a guide to costs of weed control employing arsenicals. The proprietary preparation sold as "Weedex"

contains 5.6lb. of arsenious oxide per gallon and costs 14s. per gallon sold in 5-gallon drums. This is applied at the rate of 1 gallon to 150 sq. yds.; that is 2s. per chain yard. For long-term control this application rate can be doubled. Because of the very great danger to stock no trials have been carried out with this substance, even although it is the cheapest of the soil sterilants. The information is given, however, for use when circumstances permit.

9. Pentachlorophenol

I have not carried out any trials with this substance, but a trial was reported on by D. V. Gordon at the 1951 National Weed Conference. Apparently results were not at all promising.

10. Dalapon

This is a recent development. Like TCA it is a grass killer, but differs in that absorption is through the leaves rather than through the roots and it also possesses translocation properties. It is too early to judge the final outcome of a trial laid down in February in which Dalapon was applied at 80lb. per acre. So far it would appear that all grasses are completely dead.

CONCLUSION

Based on trials carried out up to the present, the chlorates and urea compounds have proved themselves well qualified to supersede orthodox methods of drain cleaning. Costs, although high in the case of the urea compounds, could still be competitive. The arsenicals, which are the cheapest of the soil sterilants, could have a place under special circumstances.

DISCUSSION

Q.—Do results with CMU vary according to soil type?

A.—On the heavier clays results have been very good, but on lighter soils weed control was not so good.

Q.—Were the trials with Borascu laid down in February? Would you expect better results if used in the spring?

A.—Trials were laid down in February. The results obtained did not warrant further investigation with this material.

Q.—Was Borascu used at rates greater than 1000lb. per acre?

A.—No.

Q.—Were the drain faces bared first?

A.—No.

Q.—What variety of *Paspalum* was treated?

A.—*Paspalum dilatatum*.

Q.—Where the vegetation killed with CMU was burnt did regrowth occur?

A.—Some seedling growth did come away where drains were not burnt, but this soon died. I suspect the same would happen even after burning.

Q.—After the winter rains did any water cress establish on CMU plots?

A.—Water cress does not appear in Hauraki Plains drains at all. After 18 months only plantain had established on the CMU treated plots.