CONTROL OF WEEDS IN DRAINS

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There is considerable interest in any chemical method of controlling weeds in drains, particularly in view of the current high cost of manual methods. Such a method would have a wide field of application covering not only the large drains of drainage areas, catchment areas etc. but also drains and ditches on farms and along roadsides.

The problem is rather a complex one involving as it does a wide range of weed species of different types - grasses, as well as broad leaved weeds on the banks and various aquatic and emergent weeds growing in the water.

Our first trial involved the removal of all dense growth of various aquatic weeds in a drain about 4 ft. wide and carrying about 2 ft. of water moving very sluggishly. The weed growth was impeding the free flow of water and removal of this growth was required before the winter rains came. Normally, mechanical methods would have been used, costing about 10/- per chain. The product we tested is an emulsion formulation manufactured by I.C.I. in Australia which is based on chlorinated benzenes and is therefore basically similar in type to the American "Benoclor". This material is simply pumped into the water to give a milky emulsion which is carried down by the flow of water and kills the weeds as it goes. As 1 gallon would cost about 10/- it was hoped that 1 gallon would be sufficient for at least 1 chain. Five gallons of the product were pumped into the water quite simply with an ordinary low pressure sprayer by holding the hand piece in water. It gave an excellent dispersion which carried downstream taking about $\frac{3}{4}$ hour to travel the 5 chains. The conditions were really excellent because it is obvious that the effectiveness against weeds must be dependent on both the concentration in the water and the time over which the weeds are exposed to this concentration. Observations two or three weeks later indicated that a very satisfactory kill of the aquatic species involved had been obtained for at least 5 chains. The drain had been fairly completely cleaned out as regards these particular weeds. This is only a preliminary result against a few specified species, namely duckweed and cape-pond weed. Other laboratory trials have indicated that at fairly high concentrations this product is completely effective against Floating Sweet Grass and in view of these results further trials are being conducted.

A point of some concern which may limit the extent of usage of this product is its effect on fish. In the trial mentioned above, eels were killed in about 20-30 minutes. From discussions held with the Wild Life Department, we understand that provided the material is used at certain specified times in the life cycle of the fish concerned it is quite possible to use it without causing mortality of fish. As a matter of interest, there appears to be only one material which is toxic to weeds and not to fish. This is a black dye which is effective against aquatic weeds when used at about 10 lbs. per acre foot of water, at which concentration it cannot be detected. Apparently little is known of its method of action. Local trials are proceeding, but it appears that this material would be more suitable for static water as in reservoirs or ponds rather than in free running drains.

The second aspect of this trial dealt with the control of established growth on the ditch banks. The species present were a typical mixture of tall fescue, Yorkshire Fog, docks, thistles, buttercups, clovers, etc. As grasses as well as broad leaved weeds were present, we concentrated on total weedkillers rather than selective ones. Although arsenic, either as a trioxide or sodium arsenite is widely used in America and has been used for this purpose in New Zealand, we did not include it in view of the toxic hazard to stock, even though it is obviously the cheapest and most effective of all total weedkillers. The materials actually used were T.C.A., Pentachlorophenol and Sodium Chlorate in the form of "Atlacide".

In considering the rate of application, it should be remembered that although 400 lbs. of "Atlacide" per acre seems an extremely heavy and expensive application, it does not appear too bad when regarded as 400 lbs. on a strip 3 ft. wide and nearly 3 miles long. Actually, it means 1-2/3 lb. per chain 3 ft. wide or 3 1/2 lb. per chain 6 ft. wide, or a cost of 1/8d. and 3/4d. respectively per chain for chemicals at the current excessively high prices.

The actual rates of application were in line with the recommended rates for the control of established grasses and were as follows:-

<u>T.C.A.</u>	75 and 150 lbs. per acre as a water solution.
<u>Pentachlorophenol.</u>	3 and 6 lbs. per acre as an emulsion in water.
<u>"Atlacide".</u>	220 and 400 lbs. per acre as a water solution.

The materials were applied with pressure equipment and a hand piece in the equivalent of 30 gallons of water per acre. Unfortunately, a fairly heavy shower of rain fell during spraying which must have reduced the efficiency of the Pentachlorophenol, but apparently did not reduce the efficiency of either T.C.A. or Sodium Chlorate which can kill through root absorption as well as by foliage contact. The area was sprayed on the 20th March and observations made about 5 or 6 weeks later indicated that the best kill had been obtained with the 400 lbs. of "Atlacide". "Atlacide" at 220 and T.C.A. at 150 lbs. had given worthwhile results. T.C.A. at 75 lbs. was quite promising, but Pentachlorophenol was not very effective at all. Further observations made recently indicate that Pentachlorophenol at the relatively low rates used was of no value whatsoever. T.C.A. at both 75 and 150 lbs. per acre has given only a moderate check to the grasses, but there is still a fairly heavy growth of grasses on the banks. "Atlacide" at 400 lbs. per acre is by far the most promising material used. A considerable proportion of the bank is free of plant growth four months after application, although there are still some patches present. "Atlacide" at 220 lbs. per acre has not proved satisfactory.

These results indicate that chemical methods involving Sodium Chlorate and/or T.C.A. alone or possibly in conjunction with 2,4-D have very interesting prospects as methods of weed control to replace the present manual methods. With the introduction of modern spraying machinery, there appears little doubt that such methods will be quite economical.

In considering the quantities of chemical required for satisfactory weed control, the most important factor is the stage of growth of the weeds concerned. The quantities required for the destruction of established grasses and weeds is very much greater than that required for young seedlings. Although we have referred above to 400 and 220 lbs. of "Atlacide" per acre, rates below this are effective against weeds provided spraying is done when they are seedlings. By correct timing of sprays to catch seedling growth, even if two sprayings are necessary, the total chemical required per acre would be appreciably less than the rates given above. This applies, of course, to T.C.A. as well as to Sodium Chlorate.

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