AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

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Batch #22

1. SUBJECT CLASSIFICATION

A. PRIMARY
Agriculture AH60-0000-0000

B. SECONDARY
Weeds

2. TITLE AND SUBTITLE
New techniques in weed control

3. AUTHOR(S)
Burrill,L.C.

4. DOCUMENT DATE
1973

5. NUMBER OF PAGES
6p.

6. ARC NUMBER
ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Or.State

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*
(In Proc.,4th Asian-Pacific Weed Science Soc.Conf.,Rotorua,N.Z.,p.306-310)

9. ABSTRACT

10. CONTROL NUMBER
PN-RAB-244

11. PRICE OF DOCUMENT

12. DESCRIPTORS
Weed control

13. PROJECT NUMBER

14. CONTRACT NUMBER
AID/CM/ta-C-73-23 Res.

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

NEW TECHNIQUES IN WEED CONTROL

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Reprinted from *Proceedings of the Fourth Asian-Pacific Weed Science Society Conference*, Rotorua, New Zealand, 1973: pp. 306-10.

NEW TECHNIQUES IN WEED CONTROL

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To introduce the subject, "New Techniques in Weed Control", it is almost necessary to define the geographical area. There are places in the world where weed control itself would be considered a "new technique" in crop production. There are other places where the phrase, "weed control", brings to mind the use of sophisticated chemicals that are able to bring about the death of undesirable plants while having little or no effect on the crop. Now the stage has been reached where as many as four different chemicals are used just to control weeds during the life of one crop. For this discussion, the subjects will be limited to herbicides or herbicide applications.

Of course not all advancements in weed control have been with herbicides. Much has been accomplished with improved machinery, better crop varieties, and clean seed. Biological control has proven to be useful, and continued research offers the promise of more progress in that area. However, by far the greatest forward strides in the control of weeds during the past 25 years has been through the use of herbicides, and there are good reasons for this trend. Machinery or removal of weeds by hand is often harmful to the crop. This fact could not be demonstrated until the use of herbicides enabled weeds to be controlled without disturbing the crop. Research has shown that weeds in cropland exert much of their harmful effect during the early life of the crop. Weeds are often difficult to remove soon enough by any method other than herbicides. Labour is becoming increasingly expensive and, even in areas where it is reported to be inexpensive and readily available, growers are having difficulty in finding sufficient hand labour during the critical weeding periods.

With these thoughts in mind, some of the most promising new techniques in weed control might be discussed.

FOAM

The first attempt to introduce foam as a herbicide application tool was met with a shrug of the shoulders and a "wait-and-see" attitude. The idea has not gone away; in fact, many growers

and custom applicators have already accepted the concept of using foam as a carrier for pesticides.

The simplicity of foam application equipment is one of the reasons for its quick acceptance. Five products are currently being marketed in the U.S. for the addition of foam to any pesticide. Their mechanical function is to produce large numbers of small bubbles by mixing the spraying formulation with air and a foaming agent.

One system is a compact, low-cost pump that generates and distributes the foam. Four others are nozzle systems that can be used in place of existing nozzles on conventional ground and aerial equipment. All systems require the addition of a foaming agent to the spray mixture.

The problem of spray drift led to the development of the foam systems and foam appears to be a useful tool in high-drift situations. Foam does not eliminate drift but it does extend application time where drift conditions are marginal. Other benefits have been observed, such as better coverage because the applicator can see where he has sprayed, cleaner equipment since foam is a cleaning agent, and fewer reloading trips because less water is used with foam applications. Better leaf coverage and penetration due to the foaming agent added to the spray mixture has been observed.

The foam being used for herbicide applications is a wet, short-lived material which quickly releases the chemical to the plant or soil surface. Thick, longer-lasting foams are being tested for such uses as frost protection, and for protecting plants during flame weeding.

The list of uses for foam will certainly grow and apparently it will be used for some time as a herbicide application tool.

ACTIVATED CARBON

The adsorptive properties of charcoal have long been known and used to purify water and air. More recently, researchers have discovered that the adsorptive properties of charcoal can be greatly increased by treating at high temperatures with an oxidizing agent. Four of the most common oxidizing agents are air, steam, sulphuric acid, and phosphoric acid. The end product is called activated carbon. The adsorption efficiency of activated carbon is also influenced by particle size, with the smaller particles being most efficient.

The first reported use of activated carbon in conjunction with herbicides was reported in 1947 and since then considerable re-

search has been conducted on various aspects. Until recently, most effort has been directed toward finding a method to use activated carbon to protect plants from soil herbicide residues already present. One technique has been to incorporate activated carbon into the soil at from 225 to 900 kg/ha on a broadcast basis. This approach has been effective but has resulted in loss of weed control from subsequent herbicide applications. With certain crops this can be overcome by using a layer of carbon that completely surrounds the roots. Another technique has been to dip the roots in carbon. Both methods have been effective but require considerable hand labour so they are restricted to high-value crops, such as ornamentals.

A logical follow-up was to use the adsorptive properties of carbon to protect crop plants from a pre-emergence herbicide. A technique has been developed in which the carbon is mixed with water and sprayed in a 2.5 cm band directly over the seeded row. Blanket herbicide applications are then made. The carbon intercepts and adsorbs the herbicide at the soil surface and protects crops planted beneath the band. This method has been most effective where a herbicide is not quite safe enough to be used on a particular crop. As would be expected, some weeds beneath the charcoal band are not killed. The amount of control here depends on the herbicide used, rate of application, and carbon rate. This practice is registered and commercially used in establishing grass seed crops in the State of Oregon. About 170 to 340 kg of carbon per treated hectare are used depending on the type and amount of herbicide. On a broadcast basis, the cost of such treatment would be very high but where only a narrow band is treated the cost becomes more reasonable.

SUBSURFACE LAYERING OF HERBICIDES

As more is learnt about the growth habits of certain weeds and the mode of action of herbicides, herbicides can be used more efficiently. Herbicides such as EPTC and trifluralin must be placed under the soil surface to prevent loss in vapour form. The normal method is to incorporate these herbicides into the top 3 to 8 cm of soil. This has proven to be effective in controlling many annual weeds which germinate within this zone, but has been less effective in controlling perennial weeds which come from greater depths.

The same amount of herbicide applied in a subsurface layer can often effectively control certain perennial weeds. The layer,

which is more concentrated than the incorporated treatment, acts as a barrier to the shoot growth of newly-developing shoots. California workers have demonstrated excellent control of field bindweed (*Convolvulus arvensis*) with trifluralin applied in a subsurface layer. They have had best results using a spray blade with nozzles mounted under the blade in such a way that a uniform layer of herbicide is deposited as the blade is pulled through the soil. The most immediate use of the technique will probably be for perennial weed control in orchards and vineyards. However, later results from California indicate that layering of trifluralin in field bindweed-infested areas in annual crops may offer even greater potential use. The layering operation offers adjustment in depth of placement which may allow more crops to develop sufficient root systems for commercially-acceptable yields.

Of course there will be a difference in response among weed species but these can usually be overcome with higher rates and repeat applications. It can also be expected that annual weeds will be a continuing problem that will need to be solved in the usual manner.

HERBICIDE ANTIDOTES

Very few herbicides have as wide a safety margin on crops as is desirable. The need is often felt for a method of increasing the safety of a certain herbicide on a given crop.

EPTC has proven to be effective in the control of certain weeds in field corn and sweet corn. Some of these weeds, such as nutsedge (*Cyperus* spp.), shattercane (*Sorghum bicolor*), and quackgrass (*Agropyron repens*), are not usually controlled satisfactorily with other commercial corn herbicides. However, corn is sometimes injured by EPTC, reducing its usefulness in certain varieties and in certain areas.

Two so-called "antidotes" are being developed which act to reduce or prevent EPTC injury to corn. One chemical (1,8-naphthalic anhydride) is now being marketed by Gulf Chemical Co. under the trade name "Protect". This is a seed treatment which is applied at the rate of 110 g per 25 kg of corn seed. It can be mixed with the seed any time before planting into the EPTC-treated soil.

Another chemical will soon be marketed by Stauffer Chemical Co. It has been tested under the code number, R-25788, (*N,N*-diallyl-2,2-dichloroacetamide). This compound is effective as a seed treatment or when mixed with the EPTC. Since Stauffer

Chemical Co. also markets EPTC, they will offer a special mix of EPTC and R-25788. The effectiveness of this material has been dependent upon the rates of EPTC and R-25788, and the corn variety.

From this short discussion it is clear that the science of weed control is not stagnant. To an unsolved problem one need only apply a little imagination, a lot of work, and perhaps a little luck. The solutions are often surprising and usually very interesting.