Sugar cane planted February 18, 1948, and given a preëmergence treatment on March 2, of 2,4-D acid applied dry at the rate of six pounds an acre. Note the ridges between rows are almost weed-free while the cane has been almost choked by weeds.

Results of preëmergence treatment w pounds an acre in solution. The cane in t treated on March 2. Compare with the unt

WEED CONTROL—effectiveness of soil tre

One of two contrasting methods might be used to control weeds in rank growing crops such as cotton, sugar cane, milo and corn:

1. A temporary sterilization of the soil to prevent the growth of weed seedlings and protect the crop;

2. A series of contact sprays beginning with a preëmergence treatment and following through with one or more post-emergence sprays until the crop is ready to lay by.

The theory that cultivation aerates the soil and conserves moisture has been proved incorrect and the root pruning—of corn, for example—considered beneficial by some actually has been harmful. Many growers have lowered the frequency of tillage in corn, effecting a considerable saving. Few, however, have dreamed of giving up completely the idea of cultivation.

The proposal that tillage be abandoned in cotton, corn, milo, sugar cane and all similar crops—with weed control being accomplished by temporary sterilization of the soil or by periodic spraying with contact sprays—should be approached cautiously but it seems certain that chemical weed control has much to offer in relieving the labor of frequent tillage through the growing period of such crops.

California farmers have experienced many serious effects of 2,4-D residues in soils but tests on toxicity and leaching of 2,4-D prove that it can be leached out, although much water is required.

Field experience bears out the wide differences in susceptibility of both crops and weeds and indicates that weedy grasses and a number of broad-leafed weeds are not subject to control at concentrations of 2,4-D commonly used.

Plot experiments and commercial application of 2,4-D salts have resulted in injury to small grains where conditions and dosages were such that the chemical was brought into direct contact with the roots of the crop at an early stage of development.

Observations indicate that the margin of selectivity between crop plants and weeds—particularly in the case of treatment through the soil—may be too small to be safe. In cotton, 2,4-D should never be used.

In the early summer of 1943 a field of recently planted onions in the Tule Lake section of California was given a pre-emergence spray with sodium dinitro ortho cresylate—commercially known as *Sinox*.

No rain fell for several weeks; the onions came up and made a fine crop.

In the winter of 1943–44 a similar planting of onions in the Sacramento river delta was preëmergence sprayed with *Sinox*. There followed several weeks of moist, drizzly weather. The chemical remained in solution in the shallow topsoil surface and the onions were injured so severely that they had to be plowed up and replanted.

These results were replicated in plot tests and it was proved that water-soluble contact toxicants were too hazardous to use in preëmergence spraying in certain vegetable crops.

Preëmergence treatments using chemicals that act through the soil are extremely subject to vagaries of the weather.

There are four rather distinct weather conditions that might affect a preëmergence treatment designed to act through the soil: (1) No rainfall following the application; (2) Light rainfall or foggy weather; (3) Moderate rainfall; (4) Heavy rainfall or flood.

Condition (1) would result in failure under most conditions because the chemical would not get into the soil surrounding the roots of the weeds.

Condition (2) might cause serious injury to the crop plants because of high concentration of the chemical in the shallow topsoil layer. Big robust plants like corn, cane, soybeans, etc., would be less subject to this injury than onions, carrots, lettuce, etc.

Condition (3) is the most favorable for successful selective action and should result in control of the weeds.

Condition (4) may result in failure for if the chemical is leached from the soil, weed seedlings will survive.

Recent tests using 2,4-D acid applied dry and the sodium salt of 2,4-D applied in solution, prove that the acid is more effective during rainy weather.

One month after application during which 3.78 inches of rain fell, six and eight pounds of 2,4-D acid per acre have kept practically all weeds under control.

Subsequent plot tests conducted during a less rainy period have proved that, with less leaching, the sodium salt is more effective than the acid.

The illustrations at the top of the page show two plots of sugar cane in Puerto Rico one treated with 2,4-D acid, the other with 2,4-D sodium salt at rates equivalent to six pounds of acid per acre. Only 0.82 inches of rain fell during the first two

2,4-D sodium salt applied at the rate of six s plot was planted on February 18, 1948, and ated cane in background.

An experimental planting of corn in unprepared soil. The plot received no tillage a was sprayed three times with combination fortified oil emulsion sprays of 2,4-D. No the weed growth on untreated soil in right foreground.

atment compared with contact sprays in rank growing crops

A. S. Crafts

weeks following the treatment; 1.63 inches during the first three weeks. This contrasts with the heavier rainfall during the previous tests: 2.58 inches during the first two weeks, 3.72 during the first three weeks.

Field tests on the drier south coast of Puerto Rico proved that four pounds of the ammonium salt of 2,4-D per acre prevented weed growth for as much as two months.

A possible safeguard against wide differences in rainfall would be the use of a combination of both 2,4-D acid and the sodium salt. Mixed half and half, these two would be effective under a wide range of rainfall variation. Dry application of the chemicals would be most economical.

One further requirement for successful preëmergence treatment through the soil is a smooth, well prepared seed-bed. Rough cloddy land cannot be treated in such a way that weeds will be killed. Planting on beds or ridges offers similar difficulties.

Contact Sprays

During some recent studies on weed control in sugar cane in Puerto Rico, a new formula was evolved for a fortified oil emulsion contact spray that should prove considerably more economical than straight or fortified oil.

In preparing this spray, 60 pounds of a medium weight aromatic oil, four pounds of pentachlorophenol and four pounds of *Oronite* stabilizer are mixed until a solution is obtained.

This concentrate is emulsified by pouring into it 92 gallons of water, the first addition of water being slow and with violent agitation. This makes enough emulsion for an acre and it will kill any green vegetation to which it is applied.

Two pounds of dinitro secondary butyl or amyl phenol can be substituted for the pentachlorophenol.

This material is first used as a preëmergence treatment one to two days before the crop comes up. A second spray is applied when the crop is about 12 inches high, care being taken to keep the nozzles low and avoid spraying the tops. Where a power rig is used, shields may be employed to protect the crop much as they are in cultivation. A third spray when the crop is 2½ to three feet high should complete the weeding. If wild morning glory is abundant in the field inclusion of one pint of an ester formulation of 2,4-D or one pound of 2,4-D acid per 100 gallons of spray will keep it in check. This combination spray has proved extremely effective in sugar cane and corn.

Where only 2,4-D susceptible weeds occur, 2,4-D can be used for all weeding, but experience indicates that such situations are rare. Continued use of 2,4-D in cane actually has been found to increase the infestation by grasses through destroying competition.

Although 2,4-D may become widely used as a preëmergence treatment in corn, there are several situations in which a program of contact spraying may be better. If 2,4-D treatment fails to do a clean job, due to unfavorable weather or a rough cloddy seed bed, the contact spray can be safely used in corn one foot or more in height without adding to the hazard of 2,4-D toxicity through the soil. Where, because of prevalence of grasses, poor seed-bed preparation, or the use of some of the less resistant varieties of corn, 2,4-D is not advisable, contact spraying can be done.

Where erosion is a problem, contact spraying should be superior to either cultivation or 2,4-D treatment because a low cover of weeds can be allowed to grow and later sprayed, leaving an organic cover on the soil with the channels of the disintegrated roots to foster drainage.

Recent work in California emphasizes the benefits of preëmergence sprays in sugar beets using fortified oil emulsions.

Trials in sugar cane indicate that such emulsions will prove useful in that crop. Field tests have proved that water soluble toxicants can be used on vegetable crops only in rain-free regions. Greenhouse experiments indicate that highly aromatic oils may injure young seedlings of both crops and weeds.

At present it seems that Diesel oil, and Diesel oil fortified oil emulsion sprays containing only water insoluble toxicants are safe to use.

In the use of 2,4-D as a soil amendment in preëmergence weed control, any form that is available and toxic to weeds also may become available to the crop and is therefore hazardous. Whereas the dosage required to control weeds in the absence of weedy grasses may be low enough to provide a wide factor of safety, where grasses are abundant such treatment should be tried with caution.

Where 2,4-D cannot be used, a fortified oil emulsion spray may prove helpful.

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