

THE CONTROL OF WEEDS IN FIELD CROPS

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MAIZE.

Perhaps there is no place where the present agricultural revolution is more apparent than in weed control of row crops. Those who have read agricultural history at all must be struck by the similarity between the present day step forward in technique with that associated in history with the name of Jethro Tull, inventor of the drill and first advocate of row crop farming, cultivation and top-dressing. His ideas as set out in his book "Horse-hoeing Husbandry" met with great opposition and abuse - it was many years before his ideas prevailed. Today the next great step forward is in progress - there is no doubt that the use of selective and hormone sprays will be just as great a step. Those of us who have helped to introduce this new idea are very thankful that the unreasoning abuse of two centuries ago has been replaced by a very reasonable "try it and see" attitude.

Weed control in Maize has always been a thorny problem. In a weedy field - and what field isn't weedy after one or two of these 8 month crops - the labour in hoeing creates not only the problem of the economic cost, but the problem also of getting the work done on all the crops before they are stunted by competition. The average farmer does not have the labour available to cope with the job in the time.

In a dry season, by harrowing soon after planting - say six days - harrowing again perhaps in the 4-leaf stage if the tilth is not too cobbly, and then scarifying so as to mould the soil on the weeds in the row, deals with the problem. Meticulous care in planting and the use of properly designed equipment will permit this system to work, but in a dry season only, and then only when Californian thistle, convulvulus and similar weeds are not a problem. In a showery spring the harrowings are missed (and this is very often the case) with the result that the weeds, fathen, amaranthus, nightshade, Bathhurst burr, turnip, become fully established and grow faster than the Maize. It is doubtful whether hand hoeing - if possible - is economic at today's costs, even though crops exceed 100 bushel considerably and the price is in excess of 10/- per bushel. The final step in this form of weed control is to turn some average type hoggets among the crop after the cobs are formed. These sheep fatten on the weeds and clean up the lower maize leaves. Of course the sheep must be removed before they start dragging down the stalks and eating the cobs.

With the advent of hormone sprays, however, the crop has become fully mechanised, and this despite a fundamental difficulty in that corn is slightly susceptible to 2,4-D and M.C.P. and that the degree of susceptibility differs both with the variety and with the stage of growth.

The use of  $\frac{1}{4}$  or  $\frac{1}{3}$  lb. of 2,4-D acid in the amine salt form applied in 4 - 8 gals. water per acre at an early stage - say in the 4-leaf to the first scarifying stage - will eliminate weeds. The shade of the growing crop will suppress the next germination which will not appear for several weeks. I personally believe - after several thousand acres of contract spraying in this crop - that if the spraying is done early enough - that is when the weeds are pure seedlings - and in ideal conditions - early morning during still air - that half this quantity, say 2 ozs. of 2,4-D acid is quite sufficient. In such circumstances material cost could be as low as 2/6d. per acre. That is cheap "weed control" in a crop fetching in as much as £70 per acre gross.

Unfortunately farmers are inclined to hope that weeds will not be so bad, leave it a bit late, and let weeds get four to six inches high or more, with the result that a half-pound of acid is needed for complete control. The material cost is then in the neighbourhood of 10/- per acre. At this point also other troubles creep in,  $\frac{3}{4}$  pound of acid is as much as Pfister 360 or the U.S.13 hybrid will stand. If the Maize is over 12 inches high, or more than 12 ozs. acid is applied and no row crop low spraying boom is used, there will be some serious distortion which will show up in the form of stalk lean

and tightly rolled central leaves, the plant will become brittle and easily broken for several weeks, the buttress roots will rot away, high winds will break off a percentage of plants and there will be some considerable yield reduction.

With the short rotation hybrids and the sweet corns, a half pound of acid, or slightly less at 9 inches or over of height can cause some distortion. With such crops, light dosages applied through a row crop sprayer have given good results. This is particularly interesting as short rotation maize not only ripens in March but is, and has been in New Zealand, direct headed with a conventional header harvester. It is likely that farming in this crop will spread to the South Island, as there is no reason why it cannot be grown there on the good soils. To the straw farmer corn yields are almost unbelievable.

With such weeds as Californian thistle or convolvulus, light hormone sprays are also effective. There is a top kill on these weeds and new growth does not appear for several weeks, when it is then shaded by the fast growing corn. Treatment for two years in this fashion has obviously weakened well established stands of these difficult weeds.

The M.C.P. hormone has proved successful where the weeds are small and no hard-to-kill varieties are present. Unfortunately both amaranthus and nightshade are not easy when more than two or three inches high and Amine 2.4-D is recommended where weeds have hardened up, or when conditions are droughty and unfavourable.

M.C.P.A. may have a place among the more sensitive hybrids and sweet corns. I am sure it is worthy of a thorough test, however, the big thing is to spray before weeds are too large as then only an infinitesimal amount of hormone will be needed to give good control and there is little chance of crop damage.

#### FUTURE DEVELOPMENTS.

(1) It is interesting to note that recent American reports have been to the effect that some varieties of corn are more resistant to 2.4.5-T than to 2.4-D. An amine salt of 2.4.5-T has recently been marketed in U.S.A. It is possible that this hormone may have a place in cropping. It may also be that the recently developed amine salt of M.C.P.A. has marked advantages. The future has many possibilities.

(2) Reports of numerous and repeated experiments on pre-emergence spraying, i.e. spraying after planting but before the crop is up, would indicate that the practice cannot yet be recommended for widespread use. It would appear that 2.4-D pre-emergence is suited for heavy wet soils where mechanical cultivation may be delayed, but on sandy or acid soils or those low in humus, there is always a danger of crop injury. And also the all important factor of cost comes in, as 2 to 3 lbs. of 2.4-D acid is required. In New Zealand money this means 50/- an acre - too much when measured against the low cost of post-emergence sprays.

However, there are a few other pre-emergence chemicals which are showing great promise, not only for maize but for many other crops. One commercial firm is arranging to lay down field trials with four or five of these rather startling materials.

#### PEAS.

While some farmers handle peas as a row crop, it is generally conceded that they can very successfully be grown as a drilled crop. Unfortunately the competition of weeds is the limiting factor to the profitable use of this highly desirable legume. The methods of weed control fall into two distinct patterns - mechanical and chemical.

Where the general problem is to reduce the weed population in order that the crop may become well established and pod up before weeds take charge, the mechanical control by harrowing is possibly quite acceptable. The provision of a header with the strength and capacity to handle a bulk of half-dried weeds is essential, as is also a period of fine drying weather prior to threshing. Where weeds are thick it is hard to get the peas into good condition.

It is usual to harrow five or six days after drilling, harrowing again when the crop is up in the 2 to 4-leaf stage. The essential feature in this seems to be to harrow when the weeds have struck and have barely reached the seedling stage. The use of standard harrows is acceptable in most soils, the tractor usually being driven not faster than half-throttle in low gear. If full attention is paid to cleaning the harrows should any teeth become packed up or blocked, it is doubtful whether any great damage is done to the crop even with several harrowings; of course, only when the field was properly worked down in the first instance. If the soil is cloddy or cobbly the damage may be serious. Some farmers consider it necessary to roll the crop after harrowing to consolidate for mowing; again I think this would depend on soil type.

While fortunately this mechanical form of control reduces the weeds to a point where the fathen acts as pea sticks, unfortunately in those districts where the serious weed is nightshade the presence of even a few of these plants in each swarth will convert a header harvester into either a "concrete mixer" or a "jam machine", delivering a "porridgey" mass to the bags. Even though the peas may be dried in a few hours they are stained and are unsuitable for export, losing half their value. The cash loss is considerable, but the elimination of the weed by hand is unpracticable, with the result that in one district at least, spraying with chemical has in its second season reached the position of being accepted as sound practice by fully three-quarters of the growers.

During the past two years I experimented considerably with hormones on the headlands of my pea paddocks. Both amine salt 2,4-D and sodium salt M.C.P.A. were tried. I came to the conclusion that while fathen could be controlled at about 1-2 ozs. of 2,4-D and the peas would recover, I had to make it stronger to get the nightshade and the peas then died first. M.C.P. did not appear to control nightshade. However, D.N.O.C. gave such outstanding results that it has taken most of the problems out of growing peas, the more so that it has now been superceded by an even more effective, and certainly more convenient material, D.N.S.O.B.P.

I was fortunate perhaps in gaining several successful jobs right at the commencement and now, with the experience gained on my own crops and on well over a score of large contract areas, have the confidence to decide the reasons for the two or three indifferent results. I am sure that Mr. Blair - who gave such an informative paper last year at Lincoln College - was correct when he indicated that for general purposes a low volume spray of approximately 20 gallons per acre would give good results.

The spraying has all been carried out for the second season on the same basis of 25 gallons per acre, and for those mechanically interested, a 22 ft. 6 in. boom, Monarch No. 39 tips at 14 ins. space, 70 P.S.I. and 4  $\frac{1}{3}$  m.p.h. was the method of applying it.

Crops were sprayed at all stages from 3 inches to flowering. Some were sprayed a fortnight or so after harrowing and in this last wet season gave very good results. There is always a possibility that spraying too early may allow a later germination to take charge. Any tendency to overdose produced severe burning on young peas, particularly with the new Butyl Phenol. It was found that weeds over 2-3 inches in height were burnt back to the ground but the repeated rains of this season allowed second growth to arise from the root stock. Where weeds were young and the weather dry and hot they were, however, completely eliminated. In no case was any serious damage done to the crop.

The quantity needed varies with the temperature. Where mid-day temperature is not likely to exceed 60°F. a full gallon of 13 per cent D.N.S.O.B.P. is needed. The quantity falls to half a gallon at 80°F. If the temperature is likely to be much over 80°F. there will be severe burning of peas. However, at such heats results are so quick that a farmer in doubt could spray a trial patch and would have some idea of results in 60 minutes or so. It would appear, however, that at these higher temperatures the Dinitro tends to lose some of its selectivity. Because of this and because of the hazard to health it is probably not wise to spray if the day is likely to exceed 85°F.

The use of a wide boom and the adoption of a sound routine to

avoid unnecessary running over the crop minimise the damage of tractor wheels. This wheel damage is quickly overgrown and by mowing time cannot be seen. A farmer doesn't worry about it in his second spraying season.

The chemical control of weeds with Dinitro has one or two disadvantages, firstly the raw material is slightly inflammable - somewhat akin to petrol, it is also poisonous being absorbed through the skin under conditions of high temperature. However, I wouldn't consider it as poisonous as some garden sprays. Commonsense says, use goggles, respirator and protective clothing - and if you spill a bucketful down inside your shirt do not have a hot bath to get the yellow stain off. It will not come off - but your wife may collect your life insurance. I know, I've tried it and my wife very nearly did. It wasn't very pleasant.

It also lacks the cheapness of hormones, the raw material costing from 20/- to 30/- per acre.

The future should have much in store for this crop. The Dinitro has reached a high degree of efficiency. Reports are now coming in of a new chemical N.I.X. - i.e. Sodium Isopropyl Xanthate, which appears to be non-toxic to humans. It gives results of an equally high standard. It will be tried out here this season and should be of great use against weeds not susceptible to hormones.

Another new material - Amine M.C.P. will doubtless take its place in those areas where fathen, wild turnip and other highly susceptible weeds are the problem. It would seem to be somewhat more easy on the peas than Amine 2.4-D.

In view of the large areas of peas now being sprayed in Australia with Amine 2.4-D, it is likely that aerial spraying with its low cost per acre and high speed, will take over much of the work and become fully established. If it does I am sure New Zealand will not be far behind.

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#### DISCUSSION

MR. SKINNER: I would like to ask Mr. Baigent a question concerning the spraying of peas - I would like to know whether he has any information concerning the reaction of sprays to heat. Owing to the very dry conditions in our area the amount of D.N.O.C. spray required to get a control is fairly high, so high that the danger of burning crops is very considerable.

MR. BAIGENT: Dealing with high temperatures, I think this a most significant point - a large firm in England do not spray in temperatures rising over 80°, that is their limit and based purely for the safety of the operators. I would be very careful if the temperature was going up.

MR. FIELD: I should like to hear some opinions regarding the use and cleaning out of the machines prior to using another spray.

MR. BAIGENT: I was very worried the first season about the amount of hormones on peas. Peas will stand 2 oz. of 2.4-D. A suggested way of washing the machine out is to do it very thoroughly with some ammonia and let it stand over-night.

MR. SKINNER: We have undertaken a certain amount of spraying of root crops and the question whether it would be possible to use some machinery which had been used for hormone spraying was considered and we found that by using a solution of warm soapy water with a high ammonia content and leaving it over-night with activated charcoal in the water, it was quite possible to go out and spray crops with the same machinery, but I would advise that any rubber hose should be changed over.

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