

FIELD OBSERVATIONS WITH THIOCYANATE-ACTIVATED AMITROLE

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Summary

The promising fields of use of amitrole-thiocyanate mixture in New Zealand from practical experience are outlined. The widespread acceptance of amitrole-thiocyanate mixture programmes for the control of such troublesome perennial broadleaf weeds as Californian thistle (*Cirsium arvense*) and established docks (*Rumex* spp.), and rhizomatous grasses such as couch (*Agropyron repens*) and Indian doab (*Cynodon dactylon*), has led to further uses in diverse agricultural situations. Control of weeds such as raupo (*Typha* spp.) and Purua sedge (*Scirpus maritimus*) in waterways and of woody weeds such as blackberry (*Rubus* spp.) as well as gorse (*Ulex europaeus*) in "hormone hazardous" sites, shows the versatility of amitrole-thiocyanate mixture. Problem perennial weeds in orchards, vineyards and nurseries can be safely controlled with directed sprays in selected growth stages of the crop. It is considered that the uses of such a highly translocated, low soil residual herbicide as amitrole-thiocyanate mixture could be much more widely extended with further New Zealand assessment.

INTRODUCTION

THIOCYANATE-ACTIVATED AMITROLE has been available on the New Zealand market since 1961. Initially it was registered for use in asparagus for the control of couch (*Agropyron repens*), Californian thistle (*Cirsium arvense*) and docks (*Rumex* spp.). Since then the registration has been extended to cover many uses in agricultural and pastoral situations as well as market gardens for the control of a wide range of weeds which have proved difficult to control by other chemical and cultural methods. As additional field experience is gained, more plants are being found to be susceptible to amitrole-thiocyanate mixture, and it is proving to be a most useful and versatile chemical.

The only formulation available at present is a liquid containing 2 lb amitrole (3-amino-1,2,4-triazole) plus 1.83 lb ammonium thiocyanate per imperial gallon in equimolar proportions. Since ammonium thiocyanate is corrosive to metals the product is packed in plastic containers. All spray equipment should be flushed out with fresh water after use.

In the recommendations that follow in this paper it is considered that the addition of a specific non-ionic agricultural surfactant at the recommended rates is beneficial in obtaining complete foliage and stem coverage, and enhanced penetration.

FIELD EXPERIENCE

COUCH (*Agropyron repens*)

Couch is a troublesome weed, especially of arable land, although in pasture it is quite readily eaten by stock. In the past, control

was attempted by cultivation in association with a summer fallow or by the combination of cultivation and a smother crop. These methods proved successful only if thorough soil cultivation was practised and favourable weather was experienced. More recently, TCA at 60 to 80 lb per acre has been used, usually as an autumn or spring application. However, persistent residues from such treatments can sometimes cause damage to succeeding crops, especially cereals.

Amitrole-thiocyanate mixture has proved an acceptable alternative to TCA. At a cost of £6 16s. 0d. for the recommended application of 4 lb (all rates given in lb active ingredient per acre) (2 gal of formulation), amitrole-thiocyanate mixture is cheaper than TCA. Although this cost may be considered high, it should be appreciated that sowing of cash crops such as peas or barley is possible within one month of treatment.

For most effective results, couch should be 4 in. to 8 in. high and in active growth at the time of treatment. Ideally, all buds on the couch rhizomes should have broken from dormancy and should have produced aerial shoots. In the case of sod-bound couch infestations, prior cultivation to activate these nodal buds is a prerequisite to successful chemical control. Amitrole-thiocyanate mixture is best applied in 20 to 40 gal of water per acre with a non-ionic surfactant and sprayed to full coverage. Ten to twenty days after treatment, the area should be deep ploughed to invert the couch completely and to dissipate any amitrole-thiocyanate mixture residues remaining on the surface. Subsequent cultivation should not bring shoots or rhizomes to the surface.

Breakdown of amitrole in the soil is mainly by microbial activity, and is most rapid under warm and moist conditions. This is normally complete in about four weeks. Amitrole residues persist longest in dry soils or those low in organic matter. Subsequent crop sowings under these conditions should be delayed for five to six weeks for safety. Peas appear more tolerant to amitrole-thiocyanate mixture residues than barley.

On situations where cultivation is not practicable, such as asparagus beds and fence-lines, amitrole-thiocyanate mixture is also effective. However, because the competitive effects of cultivation and crop competition are not present, repeat applications over a period of one to two years may be required.

Indian doab (*Cynodon dactylon*), also called couch or twitch in Hawke's Bay, has successfully been controlled by autumn applications of amitrole-thiocyanate mixture at 5 lb followed by the cultivation technique mentioned.

RAUPO (*Typha* spp.)

Near to complete kills have been obtained on raupo with aerial applications of 10 lb amitrole-thiocyanate mixture in 25 gal of water after flowering during the January to April period.

Gun applications of 2 to 4 lb amitrole-thiocyanate mixture per 100 gal water have proved equally successful when applied in the autumn before frosts destroy the foliage.

The common reed (*Phragmites communis*) and niggerhead (*Mariscus ustulatus*) are also susceptible when treated with a similar concentration in early autumn.

PURUA "GRASS" (*Scirpus maritimus*)

This weed is an increasing problem in waterways and is spreading to many other situations. Applications of amitrole-thiocyanate mixture at 8 lb in 150 to 200 gal of water in both spring and autumn

give almost complete control in three applications, at the same time clearing many other species from the drain.

MERCER GRASS OR WATER COUCH (*Paspalum distichum*)

This paspalum has proved resistant to most herbicides, but spot applications of 8 lb amitrole-thiocyanate mixture per 100 gal water made to active growth between February and May have given good results. Repeat applications of 4 lb per 100 gal have aided the final kill when applied four to eight weeks later.

BLACKBERRY (*Rubus* spp.)

Amitrole-thiocyanate mixture has given some excellent results on areas of blackberry on the eastern coast of the North Island. These areas have been treated for many years with esters of 2,4,5-T, with an almost complete lack of final kill. In many cases spraying has been abandoned altogether because of poor results. One application of amitrole-thiocyanate mixture at up to 4 lb per 100 gal of water applied as an overall treatment from mid-November to May has given almost complete control on much of this type of blackberry.

For maximum control, coverage must be complete. Over-application to the point of excessive run-off and pasture damage should be avoided because amitrole-thiocyanate mixture kills both clovers and grasses. The effects of amitrole-thiocyanate mixture are much slower than 2,4,5-T but are more persistent in the stem and root crown areas. Regrowth may appear as pink, white or chlorotic tissue which usually dehydrates and sloughs off.

GORSE (*Ulex europaeus*)

During the active spring growth period of gorse from October to January, sufficient short kill can be obtained with amitrole-thiocyanate mixture at 2 to 4 lb per 100 gal of spray containing 0.1 to 0.25% non-ionic surfactant to support a destructive fire. For gorse growing in "hormone hazardous" districts, in cities or those areas more seriously affected by the "Vineyard" Regulations 1962, amitrole-thiocyanate mixture provides almost the only alternative herbicide to 2,4,5-T for gorse control. A slow back burn in the following autumn is necessary to obtain a satisfactory final control.

CALIFORNIAN THISTLE (*Cirsium arvense*)

Amitrole-thiocyanate mixture has proved most effective on this weed. The best results are obtained when the thistles are sprayed in the early bud stage using 4 lb of the mixture per acre in 30 to 40 gal of water. Treatments should be followed by cultivations on a pattern similar to that outlined for couch. However, many users have successfully employed amitrole-thiocyanate mixture in pastures as spot spray on dense patches. Under active growth conditions, the damaged pasture renovates quickly, especially if grass seed is scattered over the area three to four weeks after treatment.

Results have proved greatly superior to those obtained with "hormone" type preparation, since the amitrole-thiocyanate mixture appears to translocate much further in the horizontal system of the plant giving a more complete kill of the underground buds.

PERIWINKLE (*Vinca major*)

This weed has never been well controlled chemically and is most troublesome on sites such as shelterbelts, farmyards and cemeteries. Overall gun spray applications of amitrole-thiocyanate mixture at 2 to 4 lb per 50 gal in spring or autumn have given a high level of kills, though some follow-up spraying is usually necessary.

ORCHARDS

In both grassed down and cultivated orchards, grass and weed growth around the base of the trees can be troublesome even where inter-row mowing is practised. A gun application of 2 lb amitrole-thiocyanate mixture in 70 gal water normally treats some 1,120 trees. Spraying before fruit formation should give season-long control of most annual and perennial species. If carefully applied at pressures below 120 lb/sq. in. so as to avoid excessive contamination of the soil, no damage has been noted even on young trees, although at present spraying of trees younger than three years old is not recommended.

ASPARAGUS

Amitrole-thiocyanate mixture at 2 to 4 lb has proved particularly effective in controlling not only the serious perennial broadleaf weeds and grasses in asparagus but also for the usual annual weeds in this crop.

Certain hard to wet annual species such as fathen (*Chenopodium album*) have required the addition of a non-ionic surfactant for complete control. To avoid contamination of young spears emerging after a cutting, application of amitrole-thiocyanate mixture has to be restricted to the periods outside harvesting. The ideal time is just after the final complete cutting and before the development of any fern stage growth. The couch, docks, Californian thistle and annual weeds should be in vigorous leafy growth and at a stage prior to flowering.

CONCLUSION

With the advent of the hormone type weedkillers, annual weeds have tended to become less of a problem in many agricultural situations while deep-rooted perennial weeds have increasingly replaced them in importance. In cropping situations the need has therefore been for a highly translocated non soil residual type weedkiller. Amitrole-thiocyanate mixture, because of its outstanding mobility and persistency of action in plant tissue, at the same time coupled with low mammalian toxicity and its property of rapid microbiological breakdown in the soil, approaches the ideal herbicide for many such problems. Many potential colonies of perennial weeds are worth spot treating even at temporarily non-selective dosages for their complete control before being spread naturally or by agricultural practices. The potential uses of amitrole-thiocyanate mixture in New Zealand seem to have been only barely explored by both research workers and practical users.