WEED CONTROL IN LUCERNE

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SUMMARY

THE life of lucerne areas in New Zealand is seriously reduced by the invasion of perennial grasses which tend to smother out the lucerne plants. Treatment with dalapon at 4lb. to 5lb. per acre gives good control with little effect on the lucerne if applied in the early spring. Broad-leaved annuals and perennials can be controlled in seedling lucerne with 1lb. to 1½lb. acid equivalent of the sodium salt of 2,4-DB per acre. Thorough cultivation before sowing helps to reduce weed growth. Early application of weedicides is necessary to reduce smothering effects and resulting bare ground, which can become a source for future infestations.

Weed control in lucerne has always been a major problem to the farmer, but with the development of new chemicals and more knowledge now available of existing materials we are able to advise that the position has improved. As you all know lucerne is a valuable crop producing high yields of nutritious fodder on a variety of soils. Because of its deep root system it is able to withstand drought and produce green forage during dry periods when other crops fail. However, these characteristics and its perennial habit make the crop one which cannot readily combat weeds and the life of the stand is often determined by the amount of weed invasion rather than the vigour of the lucerne.

WEED PROBLEM

The weed problem varies with the soil type and the climate of respective districts. Basically it can be divided into two sections:—

(a) Weed growth, both annual and perennial, in newly sown lucerne.

(b) Weed ingress in established stands; usually the grass-type weeds and broad-leaved perennials.

In the former case, the problem often disappears by the time the stand has been mown once or twice, but damage can be done by smothering out the lucerne seedlings, leaving bare ground which soon becomes full of perennial weeds and which provides a source for future infestations. This is not so much a problem in Canterbury, where adequate cultivation and a summer fallow can materially reduce the weed seedling population. However, in parts of Otago and Southland where due to higher-rainfall conditions, prolonged cultivation cannot always be carried out, newly sown stands of lucerne can be heavily infested with fat-hen (*Chenopodium album*) thistles, spurrey (*Spergula arvensis*), etc. In the North Island establishment is more difficult with milder temperatures allowing more prolific weed growth. Many farmers feel the need for a weed spray which deals with this weed growth and would assist with the establishment of the crop.

The bigger problem is the latter, that is, the ingress of perennial weeds in established stands. This is common throughout New Zealand, though the problem is more serious and occurs sooner in the wetter districts and on the heavier soil types. The repeated topdressing of the crop, necessary for maximum production, also provides a boost for weed growth. In Canterbury grasses are the main problem, browntop particularly on the shingle soils and under irrigation browntop can come into the crop a few years after establishment. Adequate moisture, fertiliser, and poor competition from the lucerne allow this grass to spread rapidly. On

the heavier soils ryegrass becomes a problem; also docks (*Rumex* spp) and the biennial and perennial thistles. In Otago and Southland and the North Island the ryegrasses, docks and thistles are the main problem. Cocksfoot and timothy also enter lucerne stands, but these allow the lucerne plants to grow with them and often form associations ideal for their balance of grass and legume.

Special conditions, that is, climatic, often result in particular weeds appearing in the crop, usually only for a season, but sometimes they become permanent. For instance, in the drought experienced in the season 1955/56 many lucerne stands in Canterbury became very open and production was very low. This allowed seedlings of nodding thistle (*Carduus nutans*) and scotch thistle (*Cirsium lanceolatum*) to establish. By the following spring the thistles were spreading and threatened in many cases to smother the crops. In some areas the infestation was so heavy that farmers contemplated ploughing up stands only 1 to 2 years old. Conversely, particularly wet winters will allow weeds to establish in lucerne stands on heavy land, for example chickweed (*Stellaria media*), which has a bad smothering effect.

MANAGEMENT PRACTICES

Management of the area before and after sowing is essential to reduce weed growth and aid the establishment of the crop. Adequate cultivation treatments are essential before the crop is sown and these can reduce annual weed growth to minimum proportions. Time of sowing also can be varied to allow the crop to establish after the spring flush of weed growth. Late summer and autumn sowings are advised in some areas as a means of avoiding this. Spring sowing of the crop gives it a better start and is now preferred in South Island areas, enabling the crop to become well established before the winter months. Weed control in newly sown lucerne is often carried out by mowing the crop when the growth reaches up to a foot or so in height. The lucerne recovers before the weeds and many annual weeds are killed, the result being that a weedy area is transferred into a relatively clean lucerne stand. However, in a wet season such as the present this is not always the case and weed growth recovers as rapidly as the lucerne. Repeated mowing in new stands tends to reduce the annual weed content and some of the perennial weed growth.

CHEMICAL WEED CONTROL

(a) **Gamma phenoxybutyric acids:** It is this group which offers promise in the control of weeds in seedling lucerne. MCPB was used in trials last season and reported (1) to be too severe on the crop for general use. 2,4-DB was used and it seemed to have little effect on the seedling lucerne. Much more trial work has been carried out both overseas and in this country. Allen (2) says that "lucerne is affected to a certain extent by 2,4-DB and more by MCPB and . . . 2,4-DB appeared worthy of extensive trial." American work (3) reported that rates of 1lb. per acre of MCPB and 2,4-DB applied to established lucerne did not cause injury, but at 2lb. per acre caused some stunting which was greater with MCPB than 2,4-DB. From other reports it was shown that the butyrics were less injurious to lucerne than the acetics and there were indications that 2,4-DB was better than MCPB. (4) Both overseas and New Zealand evidence has shown that 2,4-DB is less severe on lucerne than MCPB, with both much less severe than MCPA and 2,4-D. However with this increasing tolerance we have decreasing efficiency in weed control. To

get good control the butyrics must be applied to seedling and young weed growth and they are relatively inefficient once weeds approach the flowering stage. Also the range of weeds controlled is reduced, for example dandelion (*Taraxacum officinale*) and spurrey are not affected, though they do control seedling docks very effectively.

Two trials were carried out on lucerne with MCPB and 2,4-DB on late-sown lucerne stands. In one trial where the weeds germinated rapidly in January-February and soon commenced to flower the sodium salt of 2,4-DB was applied at 1lb., 1.5lb., 2lb. acid equivalent per acre and though no visual effect was seen on the lucerne, then 6in. to 7in. in height, weed control in all plots was poor. The sodium salt of MCPB at 1lb. acid equivalent per acre showed a slight distortion of the growing tips for 3 weeks and also with it poor weed control was obtained. Californian thistle (*Cirsium arvense*) was controlled, but plantains (*Plantago* spp), spurrey, yarrow (*Achillea millefolium*), wild turnip (*Brassica campestris*), and hawkbit (*Leontodon leysleri*) all flowered and seeded.

In another trial applied in February this year on seedling lucerne only 2 to 3in. in height better results were obtained. The sodium salt of 2,4-DB applied at 1lb., 1.5lb. and 2lb. acid equivalent per acre showed little effect on the lucerne and good weed control resulted except on shepherd's purse (*Capsella bursa-pastoris*) which continued to seed. Fat-hen was fully controlled. The sodium salt of MCPB at 1lb. acid equivalent caused a growth check which persisted for 3 months and gave good weed control.

From observations on these trial areas and other treated areas it was found that with late summer-autumn sowings the time available to spray lucerne with 2,4-DB was very short and late sprayings gave disappointing weed control. It would seem that if 2,4-DB is to be used effectively in South Island conditions, earlier sowing of lucerne would be advisable so that weed seedlings could be sprayed over a longer period and results would be more effective. This would not necessarily apply in North Island districts, where weeds would not tend to run to seed so rapidly. From experience obtained this season it appears that applications of MCPB and 2,4-DB should be made at an earlier stage of weed growth than is normally recommended for MCPA and 2,4-D.

(b) **Dalapon:** This chemical in conjunction with TCA has been widely recommended for the removal of grasses from lucerne stands, as it has the advantage of being selective and comparatively small amounts are applied per acre. The results of trials and from paddocks treated this season show that early applications are needed to avoid or reduce damage to the lucerne crop. Rates of 5lb. and more per acre applied in early spring have shown visual retardation of the crop. In one trial an application rate of 7½lb. per acre applied in late August in Southland showed a severe growth check by the time of the first cut, estimated at 20 per cent. though control of ryegrass and cocksfoot was excellent. There was no visible difference at the second cut. It would appear that 4lb. to 5lb. per acre should be sufficient to eradicate established perennials such as cocksfoot and ryegrass and 2lb. to 3lb. per acre for annual grasses, without severe damage to the crop. Time of application of dalapon is important if damage to the crop is to be avoided. Application of dalapon to dormant grasses is not recommended, though in some seasons this dormant period varies and as the material takes some time to work, late winter treatments can be successful. Spraying after the first cut is not easily done, as

regrowth is rapid and many farmers are not prepared to graze down this growth. Winter spraying is somewhat risky, as leaching may occur, and there is evidence that dalapon is root absorbed (5). It would appear that late winter sprayings will become most popular and farmers must expect some temporary check to their crops if sufficient care is not taken.

Dalapon has very little residual effect and it must be remembered that lucerne does not regenerate to fill in areas where grass growth has been removed, and the bare areas tend to become infested with broad-leaved weeds and annual grasses. The addition of 5lb. of TCA will give some measure of residual effect. It must be emphasised that treatment must be applied early before the grass areas become too widespread; otherwise treatment will need to be repeated, say, every second or third year, but, of course, the life of the stand can be lengthened with one treatment.

Monuron and fenuron: These materials have been recommended and used to keep lucerne weed free. Their long residual effect gives control of germinating weed seedlings, though leaching on open soils reduces this. Application should be made in the autumn and early winter months. The maximum rate is 3lb. to 4lb. per acre, but the high cost of these materials makes their use limited. Results of trials in the Southland district showed that 2lb. per acre would not remove established ryegrasses.

WEED PROBLEMS

(a) **Nodding thistle** (*Carduus nutans*) and the **annual winged thistle** (*Carduus tenuiflorus*): These have become serious weeds within the last few years in the South Island. In the drought recently experienced they seeded freely and the seed germinated during the winter in the lucerne. Also the lack of competition allowed the parent plants to expand. The result was that in the following spring lucerne stands were heavily infested with both thistles. In two areas in South Canterbury the sodium salt of MCPB was applied to lucerne paddocks in an effort to control them. The weed population called for extreme measures and 1lb. acid equivalent per acre was applied in the second week of August. Fair control of seedlings was obtained, particularly of scotch thistle, but only poor control of the established nodding thistles, and the lucerne was severely checked in both cases, though it had been closely grazed before treatment. Recovery was good, but yields of the first cut were reduced. The treatment removed the dense mat of seedling thistles. Results on these and other areas showed that MCPB can be quite toxic to established lucerne even with late winter treatments. No work was done with 2,4-DB at the time, and it would appear that this material may give better control with less lucerne damage, though nodding thistle has proved to be a difficult weed to control.

(b) **Californian thistle** (*Cirsium arvense*): This thistle tends to die out with repeated mowings and where infestation is severe treatment with 2,4-DB should help to control it, with repeat applications perhaps necessary.

(c) **Docks** (*Rumex* spp): These become established in lucerne grown under high-fertility conditions and persist even with repeated mowing. Probably the best control is to eradicate them when they first appear as seedlings with 2,4-DB applications. Regrowths from dock roots are harder to deal with and may respond to similar treatment, but these should be reduced by cultivation before sowing. For docks already well established in a stand there does not appear to be any simple means of treatment.

(d) **Other weeds:** Fat-hen, scotch thistle, spurrey, etc., are the problem weeds in seedling lucerne. 2,4-DB offers scope for the control of these,

but unfortunately the butyrics do not affect some species of flatweeds, for instance 2,4-DB will effectively control fat-hen and scotch thistle, but not spurrey or daisies (*Bellis perennis*). A means of control for these are protham and CIPC as pre-emergence treatments applied at up to 4lb. per acre. These are particularly effective against seedling grasses and broad-leaved annuals and also control chickweed. Dinoseb used with the correct conditions for application will also control these germinating seedlings. If an area is known to be particularly weedy and wet conditions are common, pre-emergence treatment with protham is a good preventive and the residual effect is prolonged up to 6 months, allowing the lucerne to become established without any competition.

GRASS WEEDS

Browntop (*Agrostis tenuis*): This is probably the most serious grass weed that invades lucerne especially in Canterbury. Fortunately, browntop is readily controlled by dalapon at rates low enough to have little effect on the lucerne. Browntop has been controlled with rates as low as 2lb. to 3lb. per acre of dalapon and 3lb. to 4lb. is a general recommendation. Time of application is when the browntop is not dormant and as this coincides with the growth of the lucerne, some check will be found. Late winter - early spring treatments have given best results. Again it must be emphasised that treatment must be carried out before the infestation becomes too dense; otherwise bare ground results which will readily be invaded by other weeds.

Annual grasses: *Poa annua*, barley grass (*Hordeum murinum*), goose grass (*Bromis mollis*), etc., tend to become established in older stands and sometimes in newly sown areas. Dalapon readily controls these and low rates are sufficient. The addition of TCA is recommended, as this gives sufficient residual effect to control fresh seedling growth. Two to 3lb. of dalapon and 5lb. of TCA give adequate control when applied in early spring. In some cases 10lb. of TCA per acre applied in late winter would give sufficient control.

Ryegrasses (*Lolium* spp) and **Yorkshire Fog** (*Holcus lanatus*): These tend to come in under high-fertility and wet conditions. In Southland many lucerne areas become rapidly infested with short-rotation ryegrass and the life of the stand is seriously reduced. Treatment with dalapon is recommended with rates up to 5lb. per acre and treatment in the early stages of infestation will give the best results.

Couch grasses (twitch): These sometimes become a problem in lucerne stands, but if correct cultivation has been carried out before sowing, they should not be a problem. TCA up to 20lb. per acre applied in late winter is recommended and repeat treatment in the following year may be necessary to give full control.

Cocksfoot (*Dactylis glomerata*): Cocksfoot rarely becomes a problem and cocksfoot-lucerne mixtures are prized for their hay. Cocksfoot has been eradicated with only 3lb. per acre of dalapon, but 5lb. per acre is the usual recommendation. Cocksfoot invades a paddock from the fence-lines and a treatment round the edge of the paddock is often sufficient to control it.

SUMMARY AND CONCLUSION

A brief account has been given of the ways and means of combating weed growth in lucerne with the materials known at present. Dalapon

has proved to be most useful; yet it cannot be used to control perennial grasses without some growth check, usually only a reduction of yield of the first cut. The maximum rate that should be applied to mature lucerne is 5lb. per acre and rates in excess of this may prove disastrous in a drought year where only one cut is saved. 2,4-DB is a useful chemical for spraying seedling lucerne; yet like dalapon it has an effect on lucerne which may prove to be harmful. With thorough cultivation before sowing, proper management in the early stages, and the early detection and control of invading grasses farmers should be able to extend the life of their lucerne stands and maintain the quality of their hay yields.

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DISCUSSION

Comment: In the Bay of Plenty poor establishment of lucerne is often due to poor soil fertiliser, and often the correction of soil deficiencies will serve the purpose rather than the use of weedkillers. *Amaranthus* spp are sometimes a problem, but have been controlled by mowing.

Q.—Would the speaker give information on the extent of damage caused to lucerne by 2,4-DB applications?

A.—Overseas workers have apparently noticed significant checks to the growth of lucerne following the application of 2,4-DB. In my experience a slight check to growth does occur, but it is of only limited duration.

Q.—When should 2,4-DB be applied?

A.—The most important point is ground cover. Spray as early as possible provided there is complete ground cover.

Q.—What is suggested for the control of barley grass (*Hordeum murinum*) in lucerne?

A.—Barley grass is difficult because it is usually present in various growth stages; that is, seedlings and mature plants are often present together. The recommendation is 2lb. to 3lb. of dalapon plus 5lb. of TCA per acre.

Q.—Would the treatment for sweet vernal (*Anthoxanthum odoratum*) be the same as for browntop (*Agrostis tenuis*)?

A.—Yes, but time of application is important. Sweet vernal seems to seed quickly and should therefore be sprayed early.