THE ESTABLISHMENT AND MANAGEMENT OF LUCERNE ON PUMICE SOILS IN RELATION TO THE INCIDENCE OF WEEDS

R. J. CLARE

Farm Advisory Division, Department of Agriculture, Wairakei

Summary

Weeds should be thoroughly killed by chemical treatment prior to sowing lucerne on pumice soils. Subsequently, weeds can be controlled, and often eliminated, by:

- (1) Adequate topdressing to ensure a vigorous stand of lucerne.
- (2) Severe rotational grazing by sheep.
- (3) Mob stocking and feeding out hay on the area over the dormant winter period.
- (4) Keeping areas used mainly for hay severely cultivated.

After the establishment period, chemical treatment is a costly substitute for good management, and should be resorted to only if weeds such as barley grass (*Hordeum murinum*) invade the area.

THIS PAPER is based largely on the writer's experience which has proved very satisfactory in practice. It must be made quite clear at the outset that this experience appertains, in the main, to the pumice soils of the central plateau of the North Island, but, even so, it is believed that much of the following could apply to a large extent to other lucerne growing areas.

Main lucerne growing areas of New Zealand are centred in the drier regions of notably Canterbury, Otago and Marlborough; this is because of the plant's ability to develop a deep rooting system, enabling it to withstand severe droughts in these areas. The areas mentioned have a lower rainfall than the pumice plateau, which averages well over double that of the South Island regions. It is the coarse, free-draining nature of the pumice soil, rather than lack of rainfall, that makes the need for a deep rooting plant, able to penetrate to a damper soil stratum, so important for the region. Normally, higher rainfall areas on heavier soils will grow lucerne quite satisfactorily, but it is not so important a crop, as grass pastures are more reliable for normal management, and do not require the more specialized management that is needed for lucerne. Weeds in these higher rainfall areas naturally become a greater problem.

Even though in a higher rainfall area, large parts of the pumice plateau consist of coarse-textured, free-draining flats prone to severe dryness. These flats in normal seasons struggle to maintain a sward of mixed grasses and clovers producing only 3,000 to 4,000 lb dry matter per acre per annum, whereas lucerne on these areas consistently produces 10,000 to 12,000 lb dry matter. Some varieties have yielded 15,000 lb dry matter.

It can then be appreciated that a stand of pure lucerne is an extremely valuable asset, and any other species present reduces the yield, quality and useful life of the stand. It is considered that all volunteer grasses come into the category of weeds. Emphasis is placed on the word

“volunteer” as annual grasses are sometimes sown for specialist treatment to provide winter and early spring green-feed.

All growers are well aware of the high cost of chemical weed control in lucerne. Too few, however, realize that these costs can be reduced or even eliminated by weed prevention before sowing their stand. All weed infestations have small beginnings, often spreading from a single plant. The productivity and persistence of lucerne is greatly affected by competition. It is particularly susceptible in the establishment stage, the seedling being a plant of low vigour and poor competitive ability. The long, dormant winter period is another susceptible time when winter-growing intruders can assume dominance.

ESTABLISHMENT

Successful establishment is more satisfactory if the seedbed is prepared straight out of grass, first thoroughly killing all unwanted vegetation, consisting mainly of browntop (*Agrostis tenuis*), clovers and flatweeds. It has been found that mixtures of 2,2-DPA and amitrole and, if necessary, 2,4,5-T at the rate of 5 lb plus 2 lb plus 2 lb (all rates in active ingredient per acre) in, say, 40 to 50 gal of water per acre have proved most satisfactory. Depending on species present, other chemicals—e.g., amitrole-T—can be used, but should be at sufficiently high rates to ensure a complete kill. All spraying should be completed four to six weeks prior to the commencement of cultivation, usually the end of September or early October when growth is active and about two to three inches high at the time of treatment. It is important that a maximum number of rhizome buds be in active growth above the ground to absorb the chemical.

CULTURAL CONTROL

An area with a turf mat requires cultivation prior to spraying to stimulate these buds. The area needs to be left undisturbed until maximum re-growth appears before treatment and naturally, in these circumstances, this first cultivation would need to be commenced earlier. Ploughing the area to a depth of five to six inches then follows and this is far superior to other forms of cultivation, for the reason that most of the problem grass and weed seeds are buried at such a depth as to prevent their later germination. If this is faithfully carried out, subsequent weed control is drastically reduced.

If weeds are still present after the emergence of the lucerne, and where infestations of sorrel (*Rumex acetosella*), browntop, etc., are still particularly heavy and threaten survival of the stand, the area should be topped either by mowing or grazing off quickly by large numbers of sheep, and then tine-harrowed severely. This should begin when the lucerne plants are two to three months old, that is, some time in January when conditions are really hot and dry. This makes the top few inches of soil very dry and loose, and unfavourable to the growth of weeds. This may sound drastic, but this cultivation does not harm the lucerne which by now is sufficiently deep-rooted to stand this treatment. Rather, it stimulates its growth by suppressing competition from surface weeds and encourages it to become even deeper rooted. The odd plant may be removed but it is better to lose the odd one that way than to lose more through competition from weeds. One plant every seven to eight inches apart is adequate density for a high-producing stand of lucerne. If necessary, subsequent cultivation can take place after each cut is taken, especially in the first year or so. Prior to this cultivation, necessary

nutrients should be applied and this being worked into the soil gives added advantages to the practice of harrowing.

GRAZING MANAGEMENT

Management trials have demonstrated that subsequent grazing with sheep has adequately controlled weeds in the crop, now making it virtually unnecessary to control weeds with any cultivation or chemical methods. Half-hearted grazing of lucerne provides great encouragement for weed growth. The lucerne receives the greatest check from such treatment and the weeds are encouraged to become dominant. Any grazing management of lucerne should take into consideration the nature of the plant, bearing in mind that the plant should always be allowed to recover and make as much growth as possible to strengthen its root reserves before re-grazing. Large numbers of sheep are required to ensure quick grazing, allowing reasonable recovery before re-grazing. A minimum of 350 ewes per acre should be used to graze off the lucerne in the shortest possible time, three to four days. The lucerne should be grazed off when the plants are nearing maturity and at the full height stage simulating, as nearly as possible, the technique used in ordinary haying operations. This intensive rotational grazing stimulates growth and keeps the area extremely weed-free. It is noticeable that areas used only for hay become more infested with weeds than those under this grazing system.

Over the dormant winter period, pure lucerne hay should be fed back on to the area at three 60 lb bales per hundred ewes, which is sufficient to maintain body-weights in the animals. The area becomes bared completely of any weeds that have survived previous managements and winter growing intruders are unable to survive. This also is a period when mob stocking of cattle can be of benefit without harm to the dormant lucerne by severely checking weed growth. It is preferable to empty out the cows before entering them on these areas, as their dung can introduce undesirable weed seeds into the crop. This dung needs to be harrowed after removal of the stock, as it does not break down on pumice country owing, in the main, to the shortage of worms. If it is not harrowed, this dung can kill the smothered plant and this would have a cumulative effect of thinning out plants over the life of the stand.

FERTILIZER REQUIREMENTS

Inadequate nutrients also contribute greatly to increasing the number of weeds in the stand, therefore adequate topdressing to ensure a healthy, vigorous stand is all-important. Pumice country in its virgin state cannot be described, no matter how generous one would like to be, as natural lucerne country. It lacks practically all the soil mineral nutrients lucerne demands for normal growth, and is certainly not over-endowed with organic matter. Experimental evidence, in addition to practical observations, have clearly demonstrated the essential needs of established lucerne for phosphorus, potassium, sulphur and boron at regular and fairly frequent intervals and calcium and magnesium at less frequent periods. Thus, in practice, to secure a vigorous stand of lucerne producing yields of 10,000 to 14,000 lb dry matter per acre per annum, it has been found necessary to use 8 cwt of 50% potassic serpentine superphosphate fortified with sulphur plus 30 lb borax per acre annually. This has been applied in three split dressings; half a ton of lime has been applied every second year.

CHEMICAL TREATMENT

Some small invasions of barley grass (*Hordeum murinum*) have occurred in stands and 2,2-DPA at 2 to 3 lb per acre has proved satisfactory for the control of this weed if sprayed in the actively growing pre-seeding stage. Some growth-depressing effect on the lucerne occurs but no lasting damage results. Paraquat at 4 to 8 oz to the acre on more mature barley grass has given disappointing results and severe lowering of lucerne yields. The areas have required re-spraying the following spring with 2,2-DPA.

CONCLUSION

Lucerne is undoubtedly playing an increasingly important part in raising productivity in the pumice region and any other species present seriously reduces its capacity to fulfil this role. A well-managed stand of lucerne on droughty pumice soils is very rewarding, particularly in the dry years. It then shows up as a sea of green in the dry, brown and low-producing areas of pasture.