BARLEY GRASS CONTROL

By D. M. E. MERRY, Department of Agriculture, Pukekohe

INTRODUCTION

Barley grass (*Hordeum murinum*) has spread widely, notably as the fertility of hill country has risen after aerial topdressing. It is not uncommon also on flat or rolling country used for fat lamb farming or dairying. This annual weed grass has attained ill repute because of the considerable damage it does to sheep pelts and lamb carcasses. The long spear-like seeds can perforate skins, making them worthless, while carcass rejection in some lines of lambs and hoggets slaughtered at meat works has reached alarming proportions. Cattle do not like barley grass either, especially when it is running to seed, which it does quite freely over summer. On dairy farms where barley grass has a strong hold, unpalatability of the pasture may well affect returns.

Farmers are therefore urged to be on the lookout for this pest grass round buildings and raceways, in gateways, and beneath trees and in other places which can be focal points for further spread. Saleyards, holding paddocks, showgrounds, and in some districts roadsides are all too often danger zones during summer, while farm machinery such as hay balers moving from property to property may also be suspect. On farms barley grass is often found in thick patches on sheep camps, round troughs, and under trees and in similar sites which get more than ordinary traffic. It is tolerant of shade, and though shallow rooted, finds sufficient moisture beneath shelter belts to grow and dominate most other grasses, certainly the worth-while ones.

HOW IS IT SPREAD?

Probably the buying in and feeding out of hay cut from infested pastures is a major cause of barley grass seed dispersal, but attachment of the bristled seeds to wool and the coats of other livestock, including dogs, and between the cloven hoof are commonly accepted ways of spreading it. Trouser cuffs and the wind are other methods of spread. When once barley grass has a foothold it is naturally endowed to succeed under just those conditions where better grasses fail; that is, in weakening pastures after dry summers or droughts, where insect damage has been severe, and on overgrazed or winter pugged land. These then are the conditions which have to be met and corrected in control. This insidious grass must be attacked on private, commercial, and public property. Fortunately modern weedicides give promise of practicable results.

IDENTIFICATION

Barley grass is easiest identified in seed head. It has the general appearance of the grain crop from which it takes its name. These heads turn a golden brown as they ripen, and bending to a breeze can make quite a pretty picture, but not one to take pride in. At this stage, unfortunately, much of the seed has matured and it is far too late to contemplate spraying. Being an annual the old plants should die anyhow. The cardinal point, therefore, is that farmers and others trying to exterminate barley grass **must spray in the early and vegetative stages**. This fact is heightened by recent research on barley grass by G. S. Harris, Grasslands Division, Department of Scientific and Industrial Research, Palmerston North. He has found, among other things, that the seed needs no after ripening or maturity, it is highly viable, and there seems to be no carry-over of germinable seed from season to season after any remaining from the previous autumn has struck in the spring. Theoretically then, if this finding applies generally, **barley grass could be eliminated from a paddock if by one or more sprayings all young plants could be killed that season, thereby preventing further reseeding**. Thus the importance of being able to

positively identify barley grass in its immature and early growth. Briefly this is achievable:

- (a) In very young seedlings by carefully lifting one or more from the surface litter where they are usually found and noting whether the shoot and rootlets are still joined to the long spear-like mother seed.
- (b) In older plants, by observing the leaf structure carefully and its attachment to the stem. Barley grass leaves are lighter green, broader than ryegrass, have no sheen, and often twist toward their tip. Both leaf surfaces have short bristle-like hairs. At the base of each leaf there are two pointed projections or "claspers" which encircle the stem, somewhat like arms. These provide a good means of positive identification because no other common grasses have them.

OTHER FEATURES OF GROWTH AND PREVIOUS ATTEMPTS AT CONTROL

Normally barley grass is maturing seed over summer from about November on. This usually strikes readily with the first autumn rains. Last year, however, was an exception in South Auckland, when because of the wetter than average season the main seeding was in December. In early January, particularly under trees, the ground was carpeted with thick patches of young seedlings.

Over the years many farmers have tried to get rid of barley grass by various means, at best with only partial success. Methods have included close grazing, pulling and chipping out plants when they could be identified by their seed heads, topping, cutting for silage, and lastly ploughing and cropping before resowing to grass. Close grazing has been relatively ineffective, as barley grass then forms seed heads almost on the ground. Secondly, it has never been possible to find and remove every plant in a paddock and a lot have remained to reseed. Thirdly, cultivation has given temporary but reasonable results only because some viable seed has remained to complete the annual cycle, and there has always been trouble from reinfestation along headlands, beneath fencelines, and from adjoining paddocks. The same thing has happened when sprays like sodium chlorate have been used on raceways, etc.; some seedlings have come away after treatment to perpetuate the grass. It is now fairly clear that future attacks must be pressed home like the killer policy for rabbits. Treatment must be continued until every last plant in the paddock has been wiped out. In breaking the annual seeding cycle lies the hope of success.

SCOPE OF PAPER

This paper reports on barley grass control trials undertaken in the Auckland Superintendency of the Department of Agriculture during the past four years. They have been located from Mangere, near Onehunga, southward through the Pukekohe, Hamilton, Matamata, and Te Awamutu instructorates. There have been nearly a score of trials in 1958 alone. Most of them have been on easy rolling country, with a few on the steeper hills. Nowhere would it have been necessary to resort to aerial spraying. The chemicals were all applied mixed with water, and mostly by knapsack, though in some of the earlier ones TCA was put on by watering can. A very comprehensive range of rates of TCA and dalapon have been tested, alone, mixed, and in a few cases amitrol was included also. The trials commenced with simple layouts, developing to more complex and replicated treatments, put on with fine nozzle sprays at monthly or bi-monthly intervals right through from one autumn to the next summer. Conditions of weather, stage of pasture when sprayed, and other relevant details have been recorded. From these, plus one visit to a number of trials in January 1959 and the help of discussions with the instructors, I have summarised the results. More trials will be undertaken next season to test the validity of conclusions arrived at from present data.

EXPERIMENTAL

The chemical TCA functions mainly through root absorption, whereas

dalapon and amitrol rely largely for their killing power on the foliage. Each has a range of selectivity in its effect on the various pasture grasses, with dalapon somewhat more restricted than TCA. Naturally then the ideal conditions for use of each material differ. TCA gives best results under moist, but not over-wet conditions, whereas dalapon is most efficient with fine weather following spraying. In both, the results probably depend to some degree on closeness of grazing of the pasture at spraying. It would seem impossible to reach young barley grass seedlings efficiently under a canopy of taller grasses, even though barley grass is known to be more susceptible at the spraying rates used than is ryegrass, cocksfoot, and particularly the clovers. Further, as all of the trials have been laid down on farm paddocks with their after management out of the instructors' control, a degree of varying results must be expected. This adds considerably to the difficulties of interpretation, but is overcome where there are a large number of trials to examine and where treatments are replicated.

Typical of the investigation were those commenced by the instructor at Te Awamutu in the autumn of 1956. The treatments applied were TCA at 10 and 20 lb per acre and dalapon at 1, 2½, and 5 lb per acre, using 160 gallons of water per acre with the TCA and 60 gallons with the dalapon. The dalapon was applied in April in fine weather and the TCA in May on moist ground. The trials were on cow pasture. It is interesting to record the instructor's results for his first year's work. This is reported as quite negative. His remarks are significant:

1. No treatment successfully controlled barley grass in dairy pastures.
2. Dalapon at 2½ and 5 lb per acre appeared far too heavy. These amounts gave moderate to extreme pasture suppression for 4 to 5 months after treatment.
3. Dalapon at 2½ and 5 lb per acre opened up the sward so much that severe weed invasion occurred, the weeds being buttercup, hedge mustard, and more barley grass.

The initial trials led the instructor to think that heavy autumn treatments, particularly of dalapon, increased the amount of barley grass rather than reduced it. He rated TCA as better than dalapon, and particularly so when the latter was used at 1 lb per acre. At this stage of the investigation it was thought that autumn would be the best time to spray, but the results quoted tended to disprove that.

Therefore, continuing his research next season the instructor decreased the rates of dalapon so that pasture damage would be minimised, using ¼ to 1 lb per acre, and TCA was put on as previously at 10 and 20 lb per acre. Two duplicated trials were put down, again on dairy pasture. The first treatments were done in April/May with repeats in September/October. This was done to catch any spring strike coming in after the initial spraying in the preceding autumn. His findings that year (1957) were:

1. No treatment controlled barley grass perfectly.
2. TCA at 20 lb per acre applied both in autumn and spring gave good control in one plot series only and but fair control on the duplicates.
3. TCA at 10 lb per acre was unsatisfactory as were the lower rates of dalapon, ¼ and ½ lb per acre. The 1 lb per acre rate of dalapon was the best of the dalapon series.

It is difficult to suggest why anomalous results were obtained on duplicated sections of these trials. Possibly the pasture may have been too long, or it had rank patches of growth when sprayed, thus preventing the chemical from penetrating. However, other instructors had now intensified investigation of barley grass control, and a report from the Pukekohe district was circulated wherein an almost 100 per cent result had been obtained by applying 20 lb of TCA per acre in 100 gallons of water to a closely grazed sheep pasture in late October 1957. In this instance the depression of the pasture was moderately severe. This may have looked worse because the barley grass component was originally high, and its removal left a rather open sward. No oversowing was attempted because of following dry weather, and the next winter *Poa annua* came in thickly

between the ryegrass. This plot, incidentally, remained relatively free of barley grass for over a full season, though it has now been recontaminated, most likely from the untreated surround.

These encouraging results led to many more trials being put down, some in each district, and an endeavour was made to determine the time of year of best results. Treatments were done monthly or bi-monthly from autumn right through to the end of the year. The rates of dalapon have been various, ranging from 1, 1½, 2 and 3 lb per acre, with heavy rates of 4 to 6 lb per acre from September on. These increased rates were included to see whether one heavy spraying in spring would completely remove barley grass. One instructor in the Hamilton area has experimented also with dalapon, TCA, and amitrol separately and in combination. The aim was to check whether a mixture of materials might defeat unfavourable weather, which could negate any single treatment. In some trials oversowing was attempted in the spring following spraying, using complete mixtures totalling up to 30 lb of seed per acre. Here results have been poor, for even though good strikes were sometimes obtained, dry weather thereafter perished most of the establishing seedlings. Possibly better results would have followed had the ground been sod seeded or surface worked.

Summing up the results of the complete series of trials, these appear to be as follows:

1. TCA overall has given better barley grass control than dalapon. There has, however, been considerable variation in trials. The best kills have usually been at 20 lb per acre, but pasture damage has often been over-severe, particularly where the original pasture was weak in good grasses. Pasture injury has been least in winter, when growth has been at an ebb, and greatest in spring and autumn on new foliage. June, July, and September have given good results, especially when the ground has been moist but not waterlogged.
2. Dalapon at 2 lb per acre in up to 80 gallons of water per acre sprayed in July and September in fine weather on short evenly grazed pasture has given good results also and on present findings is the most economic treatment. More than 2 lb of dalapon per acre on any but the most vigorous pastures comprising ryegrass, cocksfoot, and white clover is likely to cause over-severe damage and retarded growth.
3. TCA or dalapon applied in autumn gives poor results. Four to 6 lb of dalapon in September has killed most grasses, including ryegrass, a lot of cocksfoot, but not paspalum. White clover usually dominates these plots later. Amitrol increases the severity of the result. To clear common grasses and clovers in unwanted places completely higher rates still would seem necessary. In other trial work 10 lb of dalapon plus 5 lb of amitrol suggests itself.
4. Dalapon has now superseded TCA for controlling barley grass on farms on purely economic grounds. On present charges for material alone dalapon costs about £1 5s. per acre (2 lb) and TCA £4 per acre (20 lb).

DISCUSSION AND RECOMMENDATIONS

As in a very few cases only has it been possible by spraying in spring with TCA and dalapon to remove barley grass completely, or almost so, it is suggested that one or more follow-up sprays would be necessary to catch these seedlings previously missed or germinating after treatment. Persistence in the attack is the key to success. Spraying on only evenly and closely grazed pasture also seems correct practice. Treatment up to and under fencelines will be necessary, for which purpose F. H. Collin, Instructor in Agriculture, Hastings, has advised that the spray boom be tipped up and distribution assisted with the wind. A pasture should never be sprayed when the barley grass is running to seed head. A practical difficulty in farm treatment is the burning of pasture where spray runs overlap. Soluble marker dyes may minimise this. Where one paddock only is treated

yearly on a farm, and this may be necessary because of the check to growth following spraying, care should be taken in feeding out only clean hay later on, and the transference of stock from nearby barley grass infested paddocks prevented during the summer months when barley grass is actively seeding. Sod seeding in autumn to improve sprayed pastures and topdressing are suggested. On saleyards or raceways where turf grasses are not required, and cost may not be a prime factor, the use of a soil sterilant such as monuron could be considered at up to 40 lb per acre. This should remove all vegetation for a lengthy period. Elsewhere, and on pasture, present knowledge suggests a recommendation of dalapon at 2 lb per acre applied in September with sufficient water for thorough wetting, and on paddocks evenly and closely grazed. One or more follow-up or chaser sprays should be put on about 6 weeks later, using 1 to 1½ lb of dalapon per acre, and in similar growth conditions to the previous treatment. Fine weather after spraying is imperative for good results. Beneath trees the same treatment as for pasture may be given or the strength of dalapon increased up to 10 lb plus amitrol at 5 lb per acre, if it is desired to clear all growth at one spraying. Another spraying of up to 2 lb of dalapon per acre should follow if need be, to check any seedling regrowth. Fencing off of such areas will usually be required before attempted regressing in autumn.

ACKNOWLEDGMENTS

Appreciation of assistance given by fellow officers of the Extension Division, Department of Agriculture, is recorded; also to G. S. Harris, Grasslands Division, Department of Scientific and Industrial Research, Palmerston North, for information on barley grass seed viability.

DISCUSSION

Q.—*Hordeum marinum* is fairly widespread. Did it occur in trials?

A.—As far as is known, only *H. marinum* was present in trial areas.

Comment: Barley grass was cleared out effectively in the Manawatu with 2 lb of dalapon in spring.

Q.—Is spraying practicable, as it destroys pasture?

Comment: Areas after cultivation remain free for three to four years, but after cultivation areas near fencelines remain infested. Spraying definitely is practicable, but in dairy pastures barley grass in urine patches is difficult to control.

Comment: On farm scale work for three years, using killer policy, now only isolated patches of barley grass remain. The farm was sprayed twice a year at 1½ lb of dalapon in May and October. A rate of 2 lb and above proved too severe on fat lamb pastures.

Comment: Spraying in autumn opens pasture, and spraying in spring is preferable just before clovers come away. Nozzles must be properly set for even cover. Tests have shown that ¾ spray fell over only ½ width of the nozzle.

Q.—Has any work been done with wetting agents?

A.—Yes, early trials with wetting agents gave good results.

Comment: It appears that barley grass is susceptible to dalapon. However, plants with hairy leaves are more resistant. It may be worth while adding a wetting agent and using lower rates of dalapon.