

## PENNYROYAL - A WEED OF SUMMER-MOIST PASTURES IN WESTERN AUSTRALIA

K R Dean  
Agriculture Protection Board of Western Australia  
South Perth, WA 6151

*Summary.* Pennyroyal is a major weed in two discrete areas of Western Australia. The plant's ability to invade healthy pasture swards is causing concern to farmers, particularly as no reliable control measures are available. An ecological approach to control is advocated together with limited regulatory activity.

## INTRODUCTION

Pennyroyal, *Mentha pulegium*, is a declared (noxious) plant in several local authority (shire council) areas along coastal parts of the south-west of Western Australia where the annual rainfall exceeds 1000 mm. In these areas it has invaded summer-moist pastures where it has largely replaced annual legumes and grasses, severely reducing pasture production.

Pennyroyal has been present since 1937 in the Albany and Denmark Shires (Rutherford and Pearce, unpublished) where it has probably reached its full potential. It arrived recently in the lower south-west Shires of Busselton, Manjimup and Augusta-Margaret River where it is actively invading and spreading.

Despite research, reliable chemical control of pennyroyal has not been achieved, and investigations into agronomic and ecological solutions are now being considered.

## BIOLOGY, DISTRIBUTION &amp; ABUNDANCE

The history, ecology and significance of pennyroyal in WA is well documented (1,2,3).

Pennyroyal is a summer-growing stoloniferous perennial herb. The parent plant remains dormant during winter and begins growth from the underground rootstock in October. Flowering occurs from November to March when hairy flowering stems, up to 500 mm tall, are produced.

Seed production appears highest in pastures. Soil seed banks in the order of 55,000 - 176,000 seeds/m<sup>2</sup> have been recorded(2). Seed buried by trampling stock may confer an enforced dormancy of 12 months or more, since seeds have a nearly-obligate requirement for light (1).

Seed germination may occur at anytime during the year when exposed to light, provided sufficient moisture is present. The plants capacity to germinate and exhibit seedling survival, when flooded to depths of 100 mm for long periods, contributes largely to its ability to encroach into and persist in seasonally inundated sites (1,2).

Pennyroyal is an unusual candidate for a weed, since it is a member of the mint family which is cultivated as a culinary and medicinal herb in many parts of the world. In other parts of Australia, it is not regarded as a particularly invasive or competitive plant in pastures (4) although it has been recorded as a common weed in Morocco, and a weed of unknown significance in Turkey, New Zealand, Chile and Uruguay (5).

## SIGNIFICANCE AS A WEED

There has been no economic assessment of losses caused by pennyroyal. However, opinions of farmers, agronomists and Agriculture Protection Board (APB) staff indicate a high potential for grazing loss. The major impact of the plant arises from its dominance in sites which could otherwise provide valuable, high quality stock feed during summer drought, in a region where beef and dairy production are the major rural enterprises. The summer-moist pastures provide

highly nutritious green feed to fatten store stock, thus giving a market advantage at a time when most pastures are devoid of live fodder.

Claims made by landholders of agricultural loss or damage are numerous, albeit mainly unquantified. They include loss of grazing capacity through displacement of useful pasture species, avoidance of infested areas by grazing animals, contamination of hay, reports of tainting causing downgrading of whole-milk and cream, short term tainting of sheep meat and an association of low stock fertility with grazing on pennyroyal dominant pastures.

The tiny seeds are easily spread by running water, contaminated lucerne hay and pasture seed, in soil and mud carried by stock, machinery and possibly wildlife.

Although Pennyroyal is often associated with stock dung it is not clear whether seed survives through the gut of animals. Vegetative spread has been noted via root fragments on machinery. Shoulder grading along roadsides appears to help spread the weed. (7)

### CURRENT CONTROL

Herbicide control recommendations have not been widely adopted, possibly due to unreliable results, cost *versus* benefit arguments and damage to legume pastures. Herbicide treatments using triclopyr, triclopyr-picloram and triclopyr-diuron mixtures, metsulfuron-methyl and glyphosate (6) cost between \$20 and \$55 per hectare plus the cost of application. Where control has been achieved through the use of herbicides, this has lasted only for short periods, owing to rapid re-invasion by regrowth and germination from the seed bank.

Cultural techniques have included thorough cultivation at full flowering followed by establishment of Kikuyu, *Pennisetum clandestinum*. On sites where it is not possible to establish Kikuyu, thorough cultivation followed up with a herbicide treatment on regrowth has been used. Pasture damage results from these herbicides so their use is confined to spot spraying.

### PROSPECTS FOR CONTROL

Ecological. Panetta (1) has previously suggested that the most appropriate method of control would be the incorporation into the pasture system of suitable perennial legumes and grasses which can tolerate flooded and waterlogged conditions. Establishment of such useful species should reduce markedly the pennyroyal component in the pasture and increase summer grazing value. Except for Kikuyu, the perennial pasture species being used by farmers at present do not appear to be vigorous enough to compete sufficiently well with pennyroyal to suppress it. This phenomenon is observed under all grazing regimes tried by farmers.

It may be possible to control pennyroyal using various combinations of herbicide treatment, forage crop sowing, establishment of perennial-grass dominant pastures or increasing the number of suitable species in the pasture component, but this has not been evaluated.

Farmers in susceptible areas are demanding the initiation of field experimentation to find a solution to the problem and would fully support such efforts.

Biological. Because of the taxonomic affinities with useful, desirable or native *Mentha* species and its localised economic significance, it is unlikely that support could be obtained for pennyroyal as a biological control target.

Mechanical. Drainage to prevent winter inundation of susceptible areas with subsequent summer irrigation to encourage pasture growth has been suggested as a possibility, (J. Dodd, pers. comm., 1990).

Containment. The objective of the declaration is to provide community protection in the form of preventing or reducing the spread of the weed from various foci points. Measures necessary

to achieve containment include ensuring farmers use clean pasture and crop seed, taking care not to import stock or produce from infested properties, and possibly undertaking some control measures along roadsides, drainage lines and other infested areas that present a spread risk. Extension programmes might be required to help reduce the spread of this weed in fodder and other infested produce.

### COMMUNITY ATTITUDES

Pennyroyal has been regarded as a weed in the Albany and Denmark Shires for many years. It has probably reached its ecological limit in these areas. Farmers exposed to the weed in these areas are resolved to live with the problem, and have learned to manage the weed using their experience and results of experimentation conducted within the district.

A different attitude prevails in the Busselton and Manjimup regions, where there are extensive areas of summer moist pastures which are prone to invasion by pennyroyal. In these regions, farmers are concerned about the recent rapid spread, particularly in the Scott River area. There have been numerous requests from farmers for technical advice on control methods and complaints about this weed in relation to loss of pasture production and, to a lesser extent, contamination of hay.

About twenty farmers interviewed in the Northcliffe, Scott River and Margaret River areas expressed genuine concern at pennyroyal's ability to invade and dominate vigorous summer-moist pastures as well as the rapid spread noticed during the last few years.

### DISCUSSION

Although interest in pennyroyal has declined in the Albany region farmers still maintain that it is one of their worst weeds and would put more effort into control if suitable techniques were available.

In various parts of the Busselton & Manjimup regions, genuine concern is being expressed by farmers about the spread and potential to dominate vigorous pastures. Many feel frustrated that there is nothing in their power to prevent pennyroyal from eventually taking over. There is little doubt that substantial production losses occur through pennyroyal competition to summer pastures and its potential has yet to be reached.

Reliance on a purely herbicide control approach does not seem possible with present technology and investigations into agronomic technique have now been initiated. At this stage, however, the best strategies for managing pennyroyal appear to be

- extension directed at farmers in susceptible areas to ensure their awareness of the potential problem
- active and committed efforts on the parts of landholders, the general public and the APB to contain the spread of pennyroyal
- the possibility of some level of quarantine on susceptible areas or individual farms
- address pasture management issues such as poor nutrition, disease, overgrazing, inappropriate species or lack of perennial component (7)
- investigating the feasibility of draining during winter and irrigating during summer
- further efficacy screening for suitable selective herbicides.

## ACKNOWLEDGEMENTS

I thank Dane Panetta for his valuable assistance in preparing an earlier report on pennyroyal and Jon Dodd for his guidance during the preparation of this paper.

## REFERENCES

1. Panetta, F.D. 1985. *Weed Res.* 25, 301-309.
2. Panetta, F.D. 1985. *Weed Res.* 25, 311-315.
3. Panetta, F.D. 1986. *Plant Prot. Quart.* 1, 106.
4. Auld, B.A. and Medd, R.W. 1987. *Weeds - an Illustrated Botanical Guide to the Weeds of Australia.* (Inkata Press : Melbourne). p.180.
5. Holm, L., Pancho, J.V., Herberger, J.P. and Plucknett, D.L. 1979. *A Geographic Atlas of World Weeds.* (John Wiley and Sons : Toronto).
6. Madin, R.W. and Smith, T.F. 1989. *Recommendations for the Control of Declared Plants in Western Australia.* (Agriculture Protection Board of WA). 48 pp.
7. Moore, J.H., 1990. Pennyroyal (in press) *Western Australian Journal of Agriculture.*