The naturalised and cultivated annual medics of Western Australia

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Cover Page Footnote
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IT is not many years since the term pasture improvement in Western Australia was synonymous with one species only, subterranean clover. The amazing adaptability of this species to the environment enabled it to be grown in a wide range of rainfall conditions and in many different districts.

Despite its adaptability subterranean clover was not always successful. On some of the heavier forest soils of the eastern cereal and sheep districts, for example, it proved disappointing at times and this helped create interest in other pasture species. Some of these "problem" soil types carried excellent stands of naturalised medics, mainly burr medic or goldfields medic; subsequently it was found that the recognised medic pasture species, barrel and harbinger medic, could also be grown successfully.

There are now some 9,000,000 acres of improved pastures in Western Australia, and estimates based on seed utilisation indicate about 300,000 acres sown to medics. While this is only some 3 per cent. of the total, it still represents substantial progress for medics in a period of five or six years, and indications are that this proportion will increase steadily.

ORIGINS OF ANNUAL MEDICS

The medics come from lands around the Mediterranean Sea, where some 30 separate species are found growing as native plants. Some medic species are almost world-wide in distribution and the reason is not hard to find. These widespread species all have seed pods which are spiny burrs, and so they are ideally equipped for dissemination. The extensive trade in unscoured wool, stock, and other commodities from Mediterranean countries over hundreds and perhaps thousands of years, has undoubtedly been the means by which these spiny burred species spread from their original homeland.

In Western Australia the three most widespread naturalised species are burr medic or burr trefoil, goldfields medic and cutleaf medic. All have spiny burrs and while published records are found no earlier than 1915, it would appear from their widespread distribution, that they were established many years before that date, possibly soon after the colony was founded in 1829.

A total of eight different, annual medics have managed to establish themselves in Western Australia without intentional help from man. A further three species have been deliberately introduced and one of these, English trefoil—was offered in the press for sale as early as 1871. Some species, barrel medic for example, have arrived and become established without intentional assistance, and subsequently the same species has been deliberately introduced and planted as a pasture.

DISTRIBUTION OF NATURALISED MEDICS

It is reasonable to assume that the spiny burrs of all three main naturalised medics—goldfields, cutleaf, and burr
A CHARACTERISTIC feature of each of the medics growing in Western Australia is the seed pod or burr. This provides a basis for rapid identification in each instance. Most species can be readily identified by comparing burrs with the illustrations below.
medic or burr trefoil, as it is better known—enabled them to be carried to most parts of the State after their original chance introduction. They have therefore, had the opportunity over many years to colonise most suitable sites.

With their Mediterranean background it is not surprising to find the natural distribution of medics in Western Australia limited to regions with a Mediterranean climate, a heavy incidence of winter rain and long dry hot summers, in other words, from the south coast to Wiluna and Carnarvon.

Within this vast region, topography and soil type restrict the species to more defined localities, and a study of these suggests a distribution pattern already well established in other States. Unlike some clovers, the medics appear to be incapable of growing in waterlogged conditions, and this, in part, could explain the high plant density found in the drier more inland regions. In high rainfall zones vigorous stands are found only on very well drained soils.

Within these limits of climate and drainage or topography there appears also to be a specific restriction to calcareous soils, or soils ranging from neutral to alkaline, whereas the opposite holds for subterranean clover, which grows well on the acid soils of the South-West and higher rainfall cereal and sheep districts. While this preference for an alkaline or neutral soil also follows the pattern in other States the reason for the preference is far from clear. Possibly it is associated with nodulation failure if the acidity or alkalinity is outside defined limits. It may also be a direct or indirect result of a nutrient deficiency.

The rather limited experience with the cultivated species, barrel and harbinger medics, suggests that they also are restricted by similar soil and climatic barriers. However, this still allows the possibility of medics being used as a pasture on a wide range of soil types and in many different districts. For example, healthy stands of naturalised burr medic are found in extreme localities, on the coarse, calcareous Tuart sands of the high rainfall, lower west coast, and on the heavy clayey forest soils of the dry Eastern Goldfields region.

**IDENTIFICATION**

The medics or trefoils, as they are sometimes known, are legumes and belong to the botanical genus *Medicago*. They are closely related to the clovers (*Trifolium* spp.), and sometimes are loosely referred to as "clovers."

The annual medics have a yellow flower and, like the clovers, a trifoliate leaf. The medic leaf differs from that of the clovers in that the central or terminal leaflet in each group of three is on a longer stalk than those of its lateral neighbours. The true clovers have leaflets with stalks of equal length, the exceptions to this generalisation being hop and suckling clovers.

The pods are another characteristic feature of the medics. The annual species growing in Western Australia all have spirally-coiled pods while those of the clovers are straight, small, and more or less enclosed within the withered remnants of the flowers.

Plant specimens of the more common naturalised and cultivated medics are illustrated in the coloured plates. Botanical names for the various species are those used by C. C. Heyn (1963), "The Annual Species of Medicago."

**SPECIES OF ECONOMIC IMPORTANCE**

Of the 11 species growing in Western Australia only three are being sown as pastures, and a further three naturalised species are of some economic importance. These species with their respective strains, where applicable, will be discussed in more detail.

**Barrel Medic**

*Medicago truncatula Gaertn.*

Barrel medic was first recorded at Hopetoun in 1920. It is a reasonable assumption that this was a chance introduction and had not been deliberately planted. The first large-scale plantings as a pasture did not take place until the 1950's, and at present, three different strains are grown.

**Commercial Strain.**—Seed from South Australia was used to plant the first barrel medic pastures, mainly in the Merredin and Salmon Gums districts. At that stage no other strains were recognised and the type being sown was referred to simply as
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barrel medic. With the availability in more recent years of several different strains, the original type, for purposes of differentiation, is referred to normally as the “Commercial” strain.

The plant has hairy stems and leaflets, the leaflets being unmarked, wedge-shaped, and coarsely toothed towards the outer extremities. The flowers are small, yellow, and single or in clusters of two or three. The seed pod is a barrel-shaped burr consisting of four or five close coils rotating in a clockwise direction. The spines are conical, not hooked, and flattened to the pods. Six to ten yellow kidney shaped seeds (100,000 per pound) are found in each pod or burr.

Under Western Australian conditions the Commercial strain flowers in late August or early September, the interval from germination to initial flowering being some 90 days. By comparison, its flowering date is some seven to ten days later than the widely grown Dwalganup strain of subterranean clover, and is close to that of the Yarloop strain.

Experience with the Commercial strain in Western Australia shows that it has followed closely the pattern established in South Australia where it grows well on alkaline soils or soils characterised by a high available lime content.

It has been established with occasional success on the solonised red brown earths of the eastern cereal and sheep districts, soil types which carried in their virgin state Salmon Gum and Gimlet associations. It has also been established successfully in the Salmon Gums district on similar soil types and on sandy surfaced Mallee soils with a yellow-grey calcareous subsoil. In this district the strain also showed the ability to grow well on some of the heavy clay loams which in their virgin state have a relatively high soil salinity.

The Commercial strain has been found to be somewhat late-maturing for most of the cereal and sheep districts where medics are grown, and generally it has proved inferior to the recently introduced Cyprus strain. For this reason it is not planted to any extent at the present time.

Cyprus Strain.—By far the most widely grown medic in Western Australia at the present time is the Cyprus strain of barrel medic. With the exception of some 10,000 acres planted to harbinger medic the remainder of the 300,000 acres sown to medics is almost entirely Cyprus barrel medic. This strain therefore warrants more attention than is possible in a brief review of this type, and for more specific details of establishment and management techniques readers are referred to Bulletin No. 2995 “Barrel Medics for Eastern Wheatbelt Pastures,” and Bulletin No. 3199, “Don’t use a Cover Crop.” Other more detailed information on soil suitability and so forth is available from District Advisers.

The Cyprus strain was obtained in 1951 during a plant collection trip to Cyprus sponsored by the United Nations Food and Agriculture Organisation and the Commonwealth Scientific Industrial Research Organisation (C.S.I.R.O.). It was grown first at the Waite Agricultural Research Institute in South Australia and subsequently seed was obtained by the Institute of Agriculture of the University of Western Australia. From the Institute of Agriculture it was released to farmers in 1959.

The Cyprus “strain” consists of a group of strains, not a single type. The dominant strain in the association is
identical botanically to the Commercial strain and forms some 90 per cent. of the total in any stand. The main minor strain is characterised by a dark purple-brown patch in the centre of each leaflet. This leaf marking is particularly prominent during the winter months, but tends to fade as the plants approach maturity.

The Cyprus strain flowers some three or four weeks earlier than the Commercial strain. It grows well on the soil types suitable for the Commercial strain and generally has proved the superior type. It also shows a preference for alkaline soils and has some degree of salt tolerance. In the eastern cereal and sheep districts, where the Commercial strain was only partially successful due mainly to its late maturity, the Cyprus strain has grown well on the heavy Salmon Gum and Gimlet soils, the Morrell soils, including the more fluffy types, and on the red mallee soils.

When grown in the higher rainfall districts of the south west or south coast the Cyprus strain has given mixed results. The majority of soils in these regions are acidic and are more suitable for subterranean clover. Cyprus barrel medic will grow well only on the rather limited areas of neutral to alkaline soils. Even if a good first year stand is obtained the second year stand is often very poor. The strain has a high potential for hard seed production and most of the seed formed in the first year become hard and remain in that condition through to the following autumn. This results in a thin second year stand with large numbers of ungerminated seeds in the soil. Some thickening normally takes place in the third and fourth years provided competition from other species is limited.

Strain 173.—In 1939, at Forbes, New South Wales some seed was collected from barrel medic plants with a distinct purple-brown patch in the centre of the leaflets. These seeds were grown on by the C.S.I.R.O. at Canberra and subsequently a new strain was released under the name Barrel Medic 173.

Strain 173 is very similar to the Commercial and Cyprus strains, its main distinguishing feature being the central purple brown patch on the leaflet. This marking is particularly prominent during the winter, but tends to disappear in the spring. The strain also differs in that the coils of the pod rotate in an anticlockwise direction, while those of the other two strains rotate in a clockwise direction.

Strain 173 flowers about a week after the Commercial strain and generally is proportionately later in maturity. It has not been grown to any extent in Western Australia, but it is being sown fairly extensively in South Australia. In that State it is superior to the Commercial strain on many of the light calcareous sandy soils of the Murray Mallee and Eyre Peninsula. Its upright erect growth habit is considered to give it a better winter production potential than the Commercial strain.

If Strain 173 ever finds a stable place in Western Australia, probably it will be on the limited areas of calcareous sandy soils along the lower west and south coasts or in the higher rainfall cereal and sheep districts to the south of Salmon Gums.

Harbinger Medic
(Medicago littoralis Rhode)

The species name “littoralis” indicates the origin of harbinger medic. It comes originally from the sandy sea shores and coastal regions of the Mediterranean, and was introduced to Australia from California by the C.S.I.R.O. in 1943. It was grown first at the Mallee Research Station, Walpeup, Victoria, and subsequently was grown in South Australia. It was planted for the first time by the Western Australian Department of Agriculture in 1960, at the Merredin and Wongan Hills Research Stations.

Harbinger medic is similar in hairiness and leaf shape to barrel medic but generally the leaf colour is lighter green. The flowers form in clusters of three or four and rarely up to six, compared to the single, double, or rarely treble flowers of barrel medic. The pods or burrs are about 1/8 to 1/4 size of barrel medic, and contain normally only three seeds. The spirals of the burrs twist in an anticlockwise direction, the opposite direction to the Commercial and Cyprus strains of barrel medic, but the same direction as strain 173. The seeds (140,000 per pound) are approximately two thirds the size of barrel medic seeds.

Harbinger medic flowers and matures about the same time as the Cyprus strain.
of barrel medic. The burrs are not spiny and do not cling to wool to any extent. Analysis of plants and burrs shows that they are similar in feeding value to those of barrel medic.

In 1963 harbinger medic was planted on about six or seven private farms in Western Australia. In the following year (1964) it was planted on more than 150 properties in virtually all agricultural districts. This sudden, rapid development of interest stemmed from the attractive high price for seed in the summer of 1963–64, and from the favourable publicity following the sowings of 1963.

The publicity for harbinger medic came mainly from the northern cereal and sheep districts where, in 1963, the species had shown good early growth and generally was much superior to Cyprus barrel medic on some of the yellow sandy-surfaced soils. These soils normally showed increased loaminess at depth, and were generally neutral or very slightly acid. In the same region the species also grew well on some of the heavier red sandy loams which carried in their virgin state York Gum and Mallee associations. However in the same year at the Merredin Research Station on the heavier soil types the species was not outstanding and compared unfavourably with Cyprus barrel medic.

In 1964, particularly in the more southern districts, the most successful sowings were on neutral or alkaline well-drained soils. The actual structure of the soil did not appear to be a decisive factor in itself; good results were obtained on both light sandy and heavier loamy soil types, but only if they met the specifications outlined—good drainage and preferably neutral or alkaline.

In South Australia the extreme susceptibility of the species to waterlogging has also been noted and many of the areas for seed production are now being sown in the late winter or early spring. If proved successful it is a practice which may be adaptable in Western Australia particularly on the south coast where the growing seasons are sufficiently extended to permit spring sowings.

Experience with harbinger medic is so limited at this stage that it is difficult to define precise limitations or its ultimate usefulness as a pasture species, and this underlines the necessity for intending growers to obtain first hand information on site and soil suitability from their District Advisers.

Snail Medic

*(Medicago scutellata (L.) Mill.)*

This species is often called snail clover. It is a hairy, semi-erect type with flowers singly or in clusters of two or three. The pods are extremely distinctive, consisting of five or six cup-shaped coils with the basal coil almost enclosing the upper coils, hence the common name “snail.” The pods contain up to eight large, yellow, kidney-shaped seeds (25,000 per pound).

Snail medic has been grown in Western Australia from as early as 1928 with rather indifferent results. There are a number of strains but the common one flowers and matures at the same time as Commercial barrel medic and so is possibly a little late maturing. Where the plants have set seed at the end of the first year, persistence in subsequent years has not always been satisfactory, as the large pods are attractive to grazing stock and this, combined with a high hard seed content, frequently results in poor second year stands.

In South Australia the species has been found suitable for some of the sticky alkaline red clays and clay loams, and perhaps on these soil types the species may eventually find a place in Western Australia. On the more loamy or sandy soil types Cyprus barrel medic or harbinger medic would appear to be superior species.

Burr Medic

*(Medicago polymorpha L.)*

Undoubtedly one of the first medic species to be accidentally introduced into Western Australia was burr medic, burr trefoil, or burr clover, as it is sometimes called. At the present time it is found naturalised over most of the agricultural areas and some of the pastoral areas, wherever climate, soil type, and drainage conditions are suitable.

The widespread distribution of burr medic is due to the slender, hooked spines on the burr. These enable the burrs to be transported readily on stock, bags, packaging material and so forth.
The species is characteristic in having leaflets with hairless upper surfaces. The flowers are small, yellow and normally in clusters of two to eight. The burrs contain three to six seeds, about one eighth of an inch long, yellow, and somewhat more globular than those of barrel medic.

Although the species has the disadvantage of causing burr infestation to wool, its value as a pasture was recognised early, and in many instances its natural spread was assisted by farmers and pastoralists who collected burrs and scattered them by hand. Later, cleaned seed became available and this was used to further spread and establish the species.

With the introduction of Cyprus barrel medic, interest in sowing burr medic declined, but it still forms a valuable component of many unimproved pastures, particularly in the northern cereal and sheep districts.

Two types of short spined burr medic (M. polymorpha (L.) var. brevispina), have also been found naturalised in Western Australia both in agricultural and pastoral regions. They are not widespread and occur mainly as single plants or small groups of plants. They differ from the common burr medic in that the spines are very short and not hooked, or are almost entirely absent.

**Goldfields Medic**

*(Medicago minima (L.) Bart.)*

Goldfields medic is better known in other States as small woolly burr medic, and it is also sometimes referred to in Western Australia as Kalgoorlie clover. It is widely naturalised, and forms an important component of many unimproved pastures, particularly in the northern cereal and sheep districts. It is particularly common in the Eastern Goldfields at Kalgoorlie, Southern Cross, and south as far as Salmon Gums. Its spread and establishment has been mostly unintentional, although it is known that some of the stands in the eastern cereal and sheep districts were established by farmers and graziers.

Goldfields medic has a prostrate growth habit and very hairy stems and leaflets. The flowers are borne singly or in clusters of two or three. The seed pod is a spirally coiled burr with slender hooked spines, similar in many ways to that of burr medic.

Goldfields medic tends to be somewhat seasonal in occurrence, good stands being present during favourable growing seasons, while in dry years the species may be almost completely absent. In favourable seasons it responds well to superphosphate and makes a good quality high protein feed.

Like burr medic the species has one major disadvantage in that the burrs readily adhere to wool.

**Cutleaf Medic**

*(Medicago laciniata (L.) Mill.)*

As implied by its name, the most characteristic feature of cutleaf medic is its irregular leaf margin, in fact it has the general appearance of an insect-damaged leaf. The flowers are single or in clusters of two or three and the seed pod is a barrel-shaped burr covered with long spines. It is a chance introduction and probably has been growing in the State for many years.

Cutleaf medic occurs mainly in the eastern cereal and sheep districts. Generally it grows in association with goldfields medic, but normally as the minor constituent of the association. Like goldfields medic it tends to be seasonal in occurrence. A similar, naturally occurring association of these two species is common in western New South Wales.

**OTHER MINOR SPECIES**

The species described above are those which have some economic value as pastures. There are a number of other annual medics growing in Western Australia, mainly chance introductions, which are worth a brief mention to complete the record and assist possible identification.

**Black Medic**

*(Medicago lupulina L.)*

Historical records show that seed of black medic, under the name English trefoil, was the first medic seed offered for sale in the colony of Western Australia, and this appears to be the species’ only claim to fame. It is late maturing and is virtually useless as a pasture species. Small areas are sometimes found in the South-West and where it has established it appears to be more
of an annual species. In Europe it is classed as a perennial.

The leaflet of black medic is unmarked, the flowers are numerous and grouped in a rounded head on the end of a long slender stalk, and the pod contains only a single kidney-shaped seed.

Calvary Medic

*(Medicago intertexta (L.) Mill.)*

The seed pod of calvary medic is a burr and it is the most striking feature of the species. The burr consists of six to ten coils half an inch in diameter, with long curved sharp spines flattened to the pods.

The species is a chance introduction to Western Australia and is found only occasionally. It is more of a weed than a pasture species.

Button Medic

*(Medicago orbicularis (L.) Bart.)*

The pod of button medic is spineless and perhaps this is the reason for the occasional interest in its possibilities as a pasture species.

It was originally a chance introduction to the State and was first recorded from Southern Cross in 1925. Subsequently it has been tested as a pasture species on a small scale from time to time with indifferent results.

Spotted Medic

*(Medicago arabica (L.) Huds.)*

The main distinguishing feature of spotted medic is the prominent purple-brown patch in the centre of each leaflet. It was recorded from Brunswick as early as 1916 and is almost certainly a chance introduction as the seed pod is a burr with slender hooked spines.

Spotted medic is a late-maturing type and its limited occurrence indicates that it is unsuitable for general adaptation to the environment of the agricultural districts. It is found growing occasionally, generally around farm buildings on some of the older properties of the South-West.

Medicago tornata

*(Medicago tornata (L.) Mill.)*

Medicago tornata is the only species naturalised in Western Australia for which there is no recognised common name. It was first collected at Ravensthorpe in 1963, where presumably it was growing as a chance introduction.

The pods of Medicago tornata are spineless and recently some interest has been shown in it as a possible pasture species. It is interesting to note that in its native habitat, the west Mediterranean countries, it is confined to light soils and shows a preference for sandy sea shores. Western Australia is particularly well endowed with both.

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