1-1-1968

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Recommended Citation

Quinlivan, B. J.; Francis, C. M.; and Poole, M. L. (1968) "The certified strains of subterranean clover: their origin, potential use and identification," Journal of the Department of Agriculture, Western Australia, Series 4: Vol. 9 : No. 4 , Article 5.

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THE CERTIFIED STRAINS OF SUBTERRANEAN CLOVER

—their origin, potential use and identification

By B. J. QUINLIVAN, C. M. FRANCIS, and M. L. POOLE

SUBTERRANEAN CLOVER originated in the countries surrounding the Mediterranean Sea and in parts of Western Europe. Therefore it is not surprising that it grows well in the agricultural districts of Western Australia, for these regions have a typically Mediterranean climate with cool wet winters and hot dry summers.

Subterranean clover was introduced accidentally to Western Australia, probably as early as the 1830’s. Dr. J. S. Gladstones of the Western Australian University Institute of Agriculture recently collected 72 new strains, mainly along the stock routes used by the early settlers. He believes that most of these came into the colony with sheep or fodder and could have originated in England, Portugal, Madeira, or the Canary Islands. In his opinion it is unlikely that the many came from the Mediterranean basin itself, for the Suez Canal was not opened until 1869 and most of the stock movement into the colony from overseas took place before that date.

SUBTERRANEAN CLOVER AS A PASTURE

The use of subterranean clover as a pasture in Western Australia began very slowly during the difficult 1930’s and 40’s, to be followed by a virtual explosion during the 1950’s and 60’s.

There are now some 13,000,000 acres of improved pasture in the State, of which 12,000,000 acres are sown to subterranean clover. The area sown to subterranean clover is increasing by about 1,000,000 acres each year. Despite this rapid increase the area of newly cleared land is increasing at an even faster rate. This trend is unlikely to change until better-adapted strains are available, particularly early maturing types suitable for the drier cereal and sheep districts.

THE STRAIN COMPLEX

In its natural European and Mediterranean homeland subterranean clover shows considerable variation within the species and many hundreds of strains are recognizable. In all over 500 strains have been collected in Australia and overseas.

Overall variation between the strains is extreme. White and purple seeded strains are not uncommon; others have pink flowers and some have red leaflets, even the mythical “four leaf” clover has been found.

Most of these differences in leaf markings, flower coloration and so forth are of little importance to the farmer, but they are of value in seed certification schemes. They enable the strains to be identified with speed and accuracy, so ensuring that pastures being used for certified seed production are true to type.

DESIRABLE CHARACTERS OF CLOVER STRAINS

The characteristics required of subterranean clover strains vary from district to district and often within a district. Quite often, characteristics attractive to some...
farmers such as an impressive, upright growth habit, make the clover an unsuccessful competitor when heavily grazed. The ability to tolerate heavy grazing is perhaps the most important characteristic for any pasture species, particularly in the sheep raising districts.

The characters or combinations of characters which determine productivity and ability to persist from year to year under grazing are still under investigation.

In the early 1950's almost the only criterion for selection of clover strains was flowering date. Today, many other characteristics are considered important but it is probable that the list of requirements for the "ideal clover" is still far from complete.

Table 1.—The flowering dates and maturities of the certified subterranean clover strains

<table>
<thead>
<tr>
<th>Strain</th>
<th>Flowering commences</th>
<th>Seed formation completed by</th>
<th>Approximate number of days to maturity after Geraldton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geraldton</td>
<td>mid-late August</td>
<td>early October</td>
<td>0</td>
</tr>
<tr>
<td>Uniwager</td>
<td>mid-late August</td>
<td>early-mid October</td>
<td>+ 4</td>
</tr>
<tr>
<td>Dwalganup</td>
<td>mid August</td>
<td>mid-late October</td>
<td>+10</td>
</tr>
<tr>
<td>Daliak</td>
<td>late August</td>
<td>late October</td>
<td>+14</td>
</tr>
<tr>
<td>Yarloop</td>
<td>late August</td>
<td>late October</td>
<td>+18</td>
</tr>
<tr>
<td>Seaton Park</td>
<td>late August-early September</td>
<td>late October</td>
<td>+22</td>
</tr>
<tr>
<td>Dinninup</td>
<td>late August-early September</td>
<td>late October</td>
<td>+24</td>
</tr>
<tr>
<td>Woogenellup</td>
<td>mid September</td>
<td>mid November</td>
<td>+36</td>
</tr>
<tr>
<td>Howard</td>
<td>mid September</td>
<td>mid November</td>
<td>+37</td>
</tr>
<tr>
<td>Clare</td>
<td>mid September</td>
<td>mid November</td>
<td>+38</td>
</tr>
<tr>
<td>Bacchus Marsh</td>
<td>mid September</td>
<td>mid November</td>
<td>+40</td>
</tr>
<tr>
<td>Mt. Barker</td>
<td>Late September</td>
<td>Late November</td>
<td>+44</td>
</tr>
<tr>
<td>Tallarook</td>
<td>early-mid October</td>
<td>mid December</td>
<td>+62</td>
</tr>
</tbody>
</table>
It is generally agreed that the following characteristics are important:

**Maturity**

To survive from year to year in any given district a strain must mature (complete, or almost complete, its flower and seed production) before the soil moisture runs out. For this reason much earlier strains are needed in the cereal growing districts than in the south coastal districts where the period of availability of adequate moisture is two to three months longer.

Until recently the date of appearance of the first flowers was taken as the measure of maturity of subterranean clover, but this is not a fully reliable guide. The Geraldton strain, for instance, flowers later than Dwalganup, but matures and dries off nine to 14 days earlier, mainly because the period over which Geraldton produces flowers may be as much as 30 days shorter than Dwalganup. For this reason, date of last flowering is a better guide to maturity than date of first flowering and this has been used in the table which lists the relative maturities of the certified strains.

Some 20 years ago only three strains, Dwalganup, Mt. Barker, and Tallarook were in use in Western Australia. Their maturities differed widely and they were commonly referred to as the “early”, “mid-season” and “late” strains. With 13 strains now being certified such terminology is inadequate.

**Oestrogenic activity**

Subterranean clover has often been associated with lambing problems and infertility in ewes, leading to serious declines in lamb marking percentages. This problem, usually called “clover disease”, is common with the Yarloop and Dwalganup strains. This subject is fully discussed in Department of Agriculture Bulletin 3345—“Clover Disease of Sheep in Western Australia”.*

Three clover oestrogens, formononetin, genistein and biochanin A have been found in subterranean clover, and of these, workers at the University Institute of Agriculture found formononetin to be the one responsible for most of the oestrogenic activity in clover leaves.

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New strains being selected for release to farmers are low in formononetin and appear unlikely to cause any serious infertility in the breeding ewe.

**Regeneration and persistence**

A pasture species may be very productive in terms of top growth, but this will be of little value if it fails to regenerate and persist satisfactorily from year to year.

Obviously if an annual pasture species such as subterranean clover is to persist, it must be capable of setting an adequate quantity of seed. Two other mechanisms in the seeds of subterranean clover which assist in persistence are hardseededness and physiological dormancy.

Hardseededness results in only a proportion of any one seed crop germinating with the autumn rains. The remainder germinate in the following years and so ensure persistence through cropping years and poor seasons.

**Special characters**

Besides the above dominant characteristics, there are others which can be important in specific situations.

Resistance to excessively wet conditions is not an essential characteristic in most situations, but it is important to have at least some strains capable of growing in waterlogged conditions, for such areas are common on farms in medium and high rainfall regions.

Resistance to disease so far is not of critical importance to the success or failure of a strain in Western Australia although there is some evidence that clover stunt, an aphid transmitted virus disease, could be important along the south coast. It was first recorded at Esperance some 10 years ago and in the last two seasons has caused concern in the Albany and Bremer Bay regions.

Although Geraldton has a slightly lower formononetin content than Dwalganup it is capable of causing clover disease. In the drier cereal and sheep districts clover dominance is less frequent. Oestrogen intake is restricted and clover disease has not generally assumed any importance.

It appears that Geraldton will be superseded in part by the newly-released low oestrogen strains Daliak and Uniwager. However, while it remains the earliest maturing commercial strain it will continue to be sown in large quantities for some years.

**Uniwager**

Uniwager is a chemically-produced mutation derived from Geraldton, released by the University Institute of Agriculture in 1967. It has less oestrogenic activity than any other subterranean clover strain and can for practical purposes be considered oestrogen free.

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**THE COMMERCIAL STRAINS OF SUBTERRANEAN CLOVER**

There are now 13 strains of subterranean clover for which seed is available commercially or which are included in certification schemes. Some, for one reason or another, are no longer recommended types.

**Geraldton**

The Geraldton strain is a field selection released in 1959 by the University Institute of Agriculture. As its name implies it was first found in the Geraldton district. Over the last five years it has been the main strain sown in the cereal and sheep districts.

Geraldton has a prostrate growth habit, its maximum height at full maturity being about six inches. It usually finishes seed setting and reaches full maturity some 14 days earlier than Dwalganup.

The seed yields of Geraldton in districts with less than 15 inches annual rainfall are normally higher than those of Dwalganup. It also has the ability to set seed both above and below ground. Geraldton is a particularly hard-seeded strain and this, together with its higher seed production, allows better persistence than Dwalganup in low rainfall areas.
Uniwager matures four days later than Geraldton and present indications are that it is somewhat less productive in top growth and seed production. Little comparative experimental data is available as yet and it will be some years before its exact potential can be defined. It may find a place, in association with Geraldton, in the drier cereal and sheep districts.

It is anticipated that some 25 tons of Uniwager seed will be harvested in the summer of 1967/68. In the following summer, seed should be more freely available, with a probable production of about 200 tons.

Dwalganup

This original "early" strain was discovered by the late Mr. P. D. Forrest on his "Dwalganup" property at Boyup Brook where it was thought to have been accidentally introduced with ryegrass seed about 1890. Graded seed has been available for more than 30 years.

Although no longer recommended, Dwalganup remains the most widely established strain in Western Australia, accounting for at least half the total area of improved pasture.

Dwalganup is the earliest flowering of the commercial strains and is a more erect and "showy" strain than Geraldton when not closely grazed.

Dwalganup has a high oestrogen level and has caused widespread sheep infertility, particularly in the 15 to 30 inch rainfall cereal and sheep districts. Daliak, a low isoflavone strain, is a suitable replacement for Dwalganup in these districts.

Daliak

Daliak was first found on the property of Mr. A. J. Monger, "Daliak", at York in the late 1920's. It was sown to a limited extent, mainly on other properties in the York district during the 1930's.

Daliak has a growth habit similar to Geraldton but it is not as prostrate or compact. It flowers about 13 days later than Dwalganup but its eventual maturity is only four to nine days later. It maintains a high level of hardseededness and should have good persistence, where the growing season is adequate.

Daliak was recently "rediscovered" after experiments indicated that it had low oestrogenic activity. A reasonably pure line of seed was built up and released in 1967. It is expected that Daliak will largely replace Dwalganup and Geraldton in the 15 to 20 inch rainfall cereal and sheep districts. A seed harvest of about 150 tons is expected during the summer of 1967/68. In the following summer over 1,000 tons should be harvested and prices should be competitive with those of Geraldton and other common strains.

Yarloop

The Yarloop strain was first found at Yarloop some 30 years ago. It is an erect strain maturing about two weeks after Dwalganup.

Yarloop is the only commercial strain which can grow successfully on well drained soils or on winter waterlogged soils. For this latter reason it has been sown extensively on the heavy clay flats at Waroona, Harvey and Brunswick where other strains have failed.

Yarloop is very high in formononetin and is frequently associated with serious infertility in ewe flocks. Although it cannot be recommended for sheep in medium rainfall districts, it still has a place in high rainfall districts on waterlogged soils where dairying and cattle raising predominate.

Seaton Park

The Seaton Park strain was first collected from a suburb of Adelaide more than 30 years ago. It matures about a week later than Yarloop and has erect growth.

It has been grown as a pasture at the C.S.I.R.O. research station at Kojonup for 12 years, where it has performed favourably in comparison with a wide range of other strains. It normally buries its burrs and has a reasonable level of hard-seededness.

Seaton Park is low in formononetin and it seems unlikely that it would cause any marked degree of "clover disease". For these reasons seed was released to farmers in 1967.

Production of Seaton Park is being compared with that of Yarloop and Dinninup.
and if satisfactory it should largely replace these two high oestrogen strains, which fall roughly in the same maturity group. It will not replace Yarloop on waterlogged soils, for like most subterranean clovers it is adversely affected by flooding. It is expected that about 120 tons of Seaton Park seed will be harvested in the summer of 1967/68. In the following summer seed should be available at prices competitive with those ruling for Geraldton.

**Dinninup**

Dinninup was first found at Boyup Brook. It makes relatively slow winter growth, but its spring production is good and often exceeds that of Yarloop and other strains in the same maturity group. Dinninup matures only a few days later than Seaton Park. It is a prolific seed-setting strain and nearly all the burrs form below the soil surface. It grows well on some of the poor gravelly and sandy soils and was a popular strain until it was found to be very high in oestrogens and a likely cause of clover disease.

Although Dinninup is undoubtedly one of the better strains for total production and adaptability, it cannot be recommended for general planting because of its high formononetin content. It may have a place on some of the drier sandy or gravelly soils in the dairying districts.

**Woogenellup**

The exact origin of Woogenellup is obscure but it was first noticed growing vigorously on an old Group Settlement property at Manjimup about 1951. Some of the seed for the pastures established on these properties originated from a property at Elgin, where Woogenellup was subsequently found growing. This may have been the site of its first establishment in Western Australia.

Woogenellup matures about four to six weeks later than Dwalganup. It has proved extremely well suited to the Western Australian environment and is now the basic pasture species for the 20 to 30 inch rainfall districts. It has good winter production and a generally vigorous growth habit. It is not a prolific seed-setting clover and normally all its burrs form above the soil surface. It has more hard seeds than the other early midseason strains.

Although the total oestrogen content of Woogenellup is quite high, its formononetin content is relatively low and field evidence suggests it is unlikely to cause the serious infertility sometimes associated with Dwalganup and Yarloop pastures. For the next few years it should remain a major strain for the 20 to 30 inch cereal and sheep districts. Possibly the superior seed producing ability of Seaton Park may make it a successful competitor, at least in the drier edges of the region.

**Bacchus Marsh**

The Bacchus Marsh strain originated in Victoria. It flowers and matures a few days later than Woogenellup.

Bacchus Marsh gives a good bulky growth in the spring and is very palatable both in the green and dry stage. It is not normally a prolific seed-setting strain and normally all its burrs form above the soil surface. It is low in formononetin and has never been definitely associated with clover infertility.

Bacchus Marsh was planted quite widely some ten years ago, particularly at Esperance, but in some instances proved disappointing. It is an extremely soft seeded strain, most of the seeds being capable of germination by February each year. This results in some failures with “false breaks” and has led to a decrease in acreage sown.

**Clare**

Clare is a South Australian strain which matures at about the same time as Bacchus Marsh and has a similar growth habit. Because of limited field grazing experience with this strain nothing is known of its effects, if any, on ewe fertility, although oestrogen assay suggests it would be similar to Woogenellup.

In Western Australia Clare has not generally performed as well as Woogenellup under grazing (and indeed its performance under heavy grazing generally is poor). It is not sown on a large scale at the present time. However, it has some advantages which make it suitable for specific purposes. It grows well on neutral or slightly alkaline soils. On the tuart sands
south of Perth and on limey soils along the south coast. It is better than other subterranean clover strains.

Most countries with Mediterranean climates have extensive areas of neutral or alkaline soils and it is not surprising that Clare has established itself as a strain in strong demand on the seed export market. Many of the Clare pastures being grown in Western Australia were established specifically for export seed production.

Howard

The Howard strain was developed by crossing Northam A, a very early strain, with the virus-resistant Tallarook strain. It matures at the same time as Woogenellup and contains moderate to high levels of formononetin. It could cause sheep infertility.

Howard has not been sown as a pasture in Western Australia, although a few areas have been established specifically for seed production. It is resistant to the aphid-transmitted clover stunt virus and may be useful in some south coastal areas for this reason alone.

Mt. Barker

Mt. Barker is the original subterranean clover strain, found at Mt. Barker in South Australia almost 90 years ago. In Western Australia it has been grown since the early 1900's and is still the basic pasture legume in the high rainfall districts of the lower South-West.

Mt. Barker was referred to for many years as the "midseason" strain; it flowers and matures some 5 to 6 weeks later than Dwalganup and a week or so after Woogenellup. It is a very leafy strain which makes most of its growth in the spring. Its winter growth is rather poor. Mt. Barker is very low in formononetin and there is little likelihood that it will cause sheep infertility under normal farm conditions.

Tallarook

Tallarook comes from Victoria and is the latest maturing of the commercial strains, flowering in mid October.

Tallarook is grown only to a small extent in Western Australia mainly in the very high rainfall districts of the lower South-West. It is a leafy, productive strain which makes little growth until the spring. It is not a good winter pasture and is used mainly in combination with earlier maturing strains such as Woogenellup or Yarlicop.

Tallarook contains high levels of oestrogens. Although it is likely to cause sheep infertility this is of little consequence as dairying and beef cattle production are the main activities in districts where Tallarook can be grown.
SELECTION OF SUBTERRANEAN CLOVER STRAINS FOR SOWING

The selection of a strain with a suitable maturity for specific sites is not simply a matter which can be decided by rainfall or length of the growing season. Climate decides in broad terms what can be grown but soil type and topography determine to what extent climatic opportunities can be realised.

An extreme instance of soil type playing a dominant role is found at Perth, where in a 35 inch rainfall the only strains capable of persisting on the rapid-drying coarse sands are the early maturing Dwallganup and Geraldton. Gravelly hills and some sandy surfaced soils may dry out up to three weeks before the better soils and allowance should be made for this in selecting a suitable strain.

The map below shows zones in which various strains should be grown. The

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Zones Recommended for Growing Subterranean Clover Strains

Zone 1. Woogenellup, Mt. Barker; Yarloop on waterlogged areas
Zone 2. Woogenellup, Daliak, Seaton Park
Zone 3. Daliak
Zone 4. Daliak, Geraldton, Uniwager
Zone 5. Geraldton, Uniwager

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Fig. 2.—A map of the agricultural districts of Western Australia divided into zones for which specific recommendations are made.
boundaries of these zones are by no means clearly defined as it will be several years, particularly with the new strains, before they can be accurately fixed.

Zone 1

The high rainfall districts of Zone 1 are used mainly for dairying. Clover disease is not a problem here and there does not appear to be any reason to change the present practice of sowing Woogenellup and Mt. Barker on well-drained soils and Yarloop on waterlogged soils.

Towards the inland boundary of this zone, more specifically along the south coast, Seaton Park, which has a lower oestrogen content, could be used in place of Woogenellup and should be grown with it for comparison. In this part of the zone the growing season is shorter and may favour the earlier Seaton Park strain. Seaton Park is likely to be a more prolific seed producer than Woogenellup in these areas.

Zone 2

The growing season of Zone 2 should be ideally suited for Seaton Park, with some Woogenellup on the better soils with good moisture retention. Towards the eastern and northern boundary of Zone 2 Daliak should be grown for comparison with Seaton Park.

Zone 3

The maturity of Daliak appears well suited for Zone 3. All the experimental evidence available suggests that it will not cause clover disease and it has persisted satisfactorily under field conditions in the State for at least 40 years without showing any abnormal susceptibility to trace element deficiencies, diseases or insect pests. Daliak should replace Dwalganup in this area.

Zone 4

In Zone 4, Daliak should give a performance comparable to Dwalganup. In a good growing season it would establish and set seed satisfactorily but in a poor year with a dry spring (perhaps one in every five or six years) little if any, seed would form and this would lead to a failure if the year of establishment coincided with such a year. It could not be expected to regenerate satisfactorily after a crop in most years, and reseeding would be necessary.

In Zone 4, clover disease has not been recognized as a major problem and a case could be made for a continuation of sowing Geraldton as well as Daliak particularly where cereals rather than sheep are the main source of income.

The length of the growing season in Zone 4 suggests that Uniwager would be a suitable strain if its performance under field conditions proves satisfactory. Reliable information on this aspect should be available within three years, (by 1970), coinciding with adequate seed supplies at reasonable prices.

Zone 5

The only strains commercially available at present which are likely to be successful in Zone 5 are Geraldton and Uniwager. Little is known about the performance of Uniwager in this zone except that its seed production tends to be better than Dwalganup but rather less than Geraldton. Observation suggests that dry matter production could be less than either Geraldton or Dwalganup.

Clover disease has not appeared as a major problem in the outer cereal and sheep districts. This may be because relatively little clover has been sown in the zone. Whatever the explanation it suggests that Geraldton in the absence of a specific replacement could continue to be used for the next few years.
IDENTIFICATION OF THE CERTIFIED STRAINS

No two plants of subterranean clover are exactly the same. If they belong to different strains differences are only to be expected; if they belong to the same strain they will still differ according to stage of growth, soil type, fertiliser treatment, grazing management, degree of competition from other plants and other environmental influences.

Characteristics which vary according to these latter factors are obviously of little value in identification.

Bacchus Marsh, for example, has distinctive brown anthocyanin flecking on the upper leaf surface when spaced plants are grown in heavily fertilised test rows, whereas under normal pasture conditions this flecking may not be present. As far as possible the identification of the different strains is based on characteristics which are relatively stable to these external influences.

Terms used

Before proceeding with the more detailed aspects of strain identification it is necessary to explain the meaning of a few simple botanical terms such as stipule, petiole, calyx and corolla. This can best be done by reference to Figure 3, which illustrates the meaning of the terms used in the text.

The actual identification is based on the variation in the leaf, runner, flower and seed, together with data on the time of flowering.

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Fig. 3.—Drawing showing the meaning of botanical terms used in the article.
These variations are illustrated in Figure 4 where each has been given an index number or symbol. The certified strains are set out according to index numbers and symbols in Table 3. To identify a plant its characteristics as defined by Figure 4 should be tabulated and fitted to the data of Table 3.

To confirm the identification the specimen should be compared to the colour plates included in the text.

The flowering stage is the most suitable time to attempt identification. Before flowering it is not a simple matter and in many instances is virtually impossible.

A brief description of the characteristics used for identification is:—

1. Leaf
   (a) Pattern of pale central mark: Most strains have some type of marking on the upper leaf surface other than the variable brown anthocyanin flecking. Normally this marking is a pale green colour in the centre of the leaf, while at the margins it is either a pale green or white colour. A description of these markings is given in Figure 4.

   (b) Leaf and petiole hairiness: The hairiness of the leaf and petiole varies from none at all as in Clare, to very hairy, as in Dwalganup. In Table 3, the degree of hairiness is divided into four categories—

      (i) No hairs; (ii) Few hairs; (iii) Hairy; (iv) Very hairy.

   Obviously the division between the latter three groups is purely arbitrary and for this reason the differential degree of hairiness is not used as a definite means of distinguishing between strains. Where a strain is completely hairless the characteristic is used as a differential.

2. Runner
   (a) Runner hairiness: The degree of hairiness on the runners has been categorised in the same manner as that of the leaf and petiole.

   (b) Stipule markings and colour: The stipule is variable between strains but constant within any particular strain. It varies from a greenish white colour with green or red veins to a red colour with red veins. (Figure 4.)

3. Flower
   (a) Corolla colour: The colour pattern of the corolla or petals can be divided into three types—pure white, white with pink veins, and pink. Only one definite pink flowered type is known to occur under field conditions in this State and this is of minor importance. All the certified strains are classified as pure white or white with pink veins. The Dwalganup strain frequently has a decided pink tinge in the petals if the flowers are exposed to strong sunlight but if they are shaded by top-growth the petal colour pattern is normally white with pink veins.

   (b) Calyx colour: The colour pattern on the calyx of the flower is one of the most important means of distinguishing between the various strains. The colour pattern varies from a striking red band in the Mt. Barker strain to an overall greenish white colour in the Bacchus Marsh and Woogenellup strains. For the purpose of differentiation between the strains this characteristic has been divided into four groups. (Figure 4.)

   (c) Relative maturity: The maturity of the various strains is not a completely reliable guide to identification for there is a substantial overlap. However, at times it is useful and for this reason the time of first flowering has been included in Table 3.

4. Seed colour
   The seed colour is a distinctive characteristic only with the white seeded Yarloop strain. There are other white seeded strains of subterranean clover but Yarloop is the only one to be certified so far. The Mt. Barker strain frequently has a purplish coloured seed and Clare has a relatively large unusually flat type of seed, but in neither instance is the colour or structure sufficiently distinct to be used as a means of identification.
Fig. 4—Identification chart to be used in conjunction with Table 3

- = NO HAIRS  
++ = HAIRY  
+ = FEW HAIRS  
+++ = VERY HAIRY
Table 3.—Key for the identification of the certified strains of subterranean clover

<table>
<thead>
<tr>
<th></th>
<th>Leaf</th>
<th>Runner</th>
<th>Flower</th>
<th>Seed</th>
<th>Other distinctive features</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(a)</td>
<td>(b)</td>
<td>(c)</td>
<td>(a)</td>
<td>(b)</td>
</tr>
<tr>
<td></td>
<td>Pattern of pale central mark</td>
<td>Upper surface hairiness</td>
<td>Petiole hairiness</td>
<td>Runner hairiness</td>
<td>Corolla colour</td>
</tr>
<tr>
<td>Geraldton</td>
<td>L1</td>
<td>++</td>
<td>++</td>
<td>S3</td>
<td>++</td>
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<tr>
<td>Uniwager</td>
<td>Nil</td>
<td>++</td>
<td>++</td>
<td>S4</td>
<td>++</td>
</tr>
<tr>
<td>Dalganup</td>
<td>L3 L5</td>
<td>+++</td>
<td>++</td>
<td>S3</td>
<td>++</td>
</tr>
<tr>
<td>Daliak</td>
<td>L3</td>
<td>++</td>
<td>+</td>
<td>S2</td>
<td>++</td>
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<tr>
<td>Yarloop</td>
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<tr>
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<td>L2 L4</td>
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<td>+</td>
<td>S4</td>
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<tr>
<td>Dinninup</td>
<td>L1</td>
<td>++</td>
<td>+++</td>
<td>S3</td>
<td>++</td>
</tr>
<tr>
<td>Woogenellup</td>
<td>L1</td>
<td>+</td>
<td>++</td>
<td>S2-3</td>
<td>hairiness</td>
</tr>
<tr>
<td>Howard</td>
<td>L3 L4</td>
<td>++</td>
<td>++</td>
<td>S4</td>
<td>++</td>
</tr>
<tr>
<td>Bacchus Marsh</td>
<td>L1</td>
<td>++</td>
<td>+++</td>
<td>S4</td>
<td>+</td>
</tr>
<tr>
<td>Clare</td>
<td>L2 L4</td>
<td>hairless</td>
<td>hairless</td>
<td>S2</td>
<td>hairless</td>
</tr>
<tr>
<td>Mount Barker</td>
<td>L2</td>
<td>++</td>
<td>++</td>
<td>S2-3</td>
<td>+</td>
</tr>
<tr>
<td>Tallarook</td>
<td>L3</td>
<td>++</td>
<td>+</td>
<td>S4</td>
<td>++</td>
</tr>
</tbody>
</table>

Leaflets distinctly triangular.
Light green colour and complete absence of pale central mark.
Leaflets not indented; corolla sometimes distinctly pinkish.
Calyx colouration distinct purple red.
Anthocyanin frequently along lower midrib.
Pale central mark on upper leaf surface very distinct on young leaf.
Stipules larger than normal.
Colouration of leaflets bluish green.
Anthocyanin flecking on upper leaf surface particularly in young leaf.
Distinctive purple anthocyanin colouration below pale mark on upper leaf surface.
Red calyx band very distinct.
Pattern of pale central mark varies from L3 to L1.
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