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Subterranean clover in W.A.

1. The current situation

B. J. Quinlivan and C. M. Francis, Plant Research Division

From small beginnings some 50 or more years ago subterranean clover has come to dominate the pasture scene in Western Australia. Of the 7,000,000 hectares of sown pasture all but some 500,000 are sown to subterranean clover.

Further, it is estimated that there remains an area of similar size still to be sown, but in some instances these future sowings will be possible only if suitable varieties are available.

Varietal development with subterranean clover has been a rather spasmodic process. At times there have been periods of rapid advance while at others there has been no progress, perhaps even deterioration.

The selection of the Dwalganup cultivar in the early 1930's was a major advance, for it enabled millions of hectares to be sown in the relatively low rainfall (550 mm and less) areas. Similarly the development of Yarloop and Geraldton enabled further sowings to be made in areas previously considered unsuitable for subterranean clover. Cv. Woogenellup was the basis of large scale sowing in higher rainfall areas during the 1960's.

The most recent major advance followed the realisation in the early 1960's that subterranean clover cultivars differed in their capacity to cause infertility problems in sheep. This discovery and the subsequent identification of formononetin as the causal agent led to the release in 1967 of three new cultivars Uniwager, Daliak and Seaton Park, all low in formononetin, and which have proven safe for breeding ewes. Uniwager was not an agronomic success but the other two varieties have been widely sown since release.

There are now within the State, clearly defined subterranean clover
zones. These zones do not necessarily coincide with climatic boundaries, tending to reflect history as well as climate.

Clearing and pasture development within the various agricultural regions of the State took place, as a rule, within quite clearly defined time intervals and the varieties selected for sowing were those thought to suit the soil and rainfall patterns and generally to be the best on the information available at the time. Thus history and climate have combined to produce the current situation (Table 1, Figure 1).

Since 1967 two major happenings have had a profound influence on subterranean clover-based pastures in Western Australia, and both in turn have largely changed the direction of thinking among agronomists.

First, the drought of 1969 resulted in many of the pastures in the outer wheatbelt deteriorating to such an extent that few, if any plants appeared in subsequent years. Thus persistence became a factor of greater importance.

The second factor was the appearance of two diseases, clover scorch (Kabatiella caulivora) and more recently clover root rots, in subterranean clover on the south coast. These were so serious in some situations that spring growth and seed production was almost non-existent and subsequent persistence was very poor. For the first time disease resistance became a factor of major importance in subterranean clover varietal development.

No new subterranean clover varieties have been released since 1967 and the current demand for seed, therefore, reflects not only the lack of new varieties but also the interaction of farmer acceptance of new research knowledge, recent developments of disease, particularly Kabatiella, the general economic situation, and changed production priorities mainly from grazing to cropping enterprises.

Table 2 is an estimate of sales of seed of the current subterranean clover varieties, with those for 1967/68 for comparison. This was the last of the “good” years before the 1969 drought and the subsequent rural depression.

Table 2 shows that there is now a much lower level of interest in sowing subterranean clover. This is attributable partly to the changed economic situation, with depressed prices for some rural products (especially animal products) and hence a lack of finance and incentive to re-seed old pastures or to clear new land.

However, the depression does not explain the marked drop in sales of seed of the Geraldton cultivar. Geraldton is used mainly in the low rainfall wheat growing areas where farmers have had the benefits of three good seasons and continued high prices for wheat. The lower demand must therefore reflect a real decline in interest in sowing subterranean clover in the lower rainfall areas, and this may well be attributable to the poor performance of existing varieties and in particular, their lack of persistence through the dry years of 1969 to 1971.

An examination of the conditions and trends within each zone is a worthy study in the development or adjustment of existing philosophies which form the basis of the current new variety development programme.

### Zone 1. Old South Coast

In this high rainfall zone pastures are based mainly on cv. Mt Barker and have commonly deteriorated to low proportions of clover. Clover

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**Table 2—A comparison of sowings of subterranean clover varieties in Western Australia at two different times 1967/68 (before the drought and recession) and 1975 (the current situation)**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Seed usage (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1967/68 (mean of 2 years)</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Geraldton</td>
<td>3 500</td>
</tr>
<tr>
<td>Dwalganup</td>
<td>600</td>
</tr>
<tr>
<td>Daliak†</td>
<td>200</td>
</tr>
<tr>
<td>Sexton Park†</td>
<td>200</td>
</tr>
<tr>
<td>Yarloop</td>
<td></td>
</tr>
<tr>
<td>Woogenellup</td>
<td>2 800</td>
</tr>
<tr>
<td>Mt. Barker</td>
<td>300</td>
</tr>
<tr>
<td>Others</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8 000</strong></td>
</tr>
</tbody>
</table>

* Data estimated from production and export statistics and subsequently adjusted on the basis of comments from seed merchants.

† Released to farmers for the first time in 1967, thus the seed usage figure for 1967/68 does not represent a real demand at normal prices.
Above: An experiment to compare the relative abilities of varieties to form viable seed above and below the soil surface. In the foreground, plastic sheets prevent burr burial. It has been shown that some varieties, such as Daliak, have the capacity to set relatively good quality viable seed above the soil surface if necessary.

Left: A major advance in pasture improvement was the Horwood Bagshaw suction clover harvester in the early 1960s. With the advent of this machine, cheap seed in quantity became available to farmers.

Below: One of the features of subterranean clover is its ability to produce a good quality pasture on relatively poor sandy or gravelly soils.

dominance, where encountered, is usually confined to newer sowings of Yarloop, Dinninup or Woogenellup. While cv. Mt Barker may fail to dominate the sward for other reasons, such as susceptibility to false breaks, undoubtedly the major cause for the poor condition of many of the pastures has been the combined effect of diseases, especially clover scorch and root rots. The need for clovers of mid season maturity combining resistance to these diseases is clearly indicated.

Zone 2. New West Coast
Pastures in this zone are largely clover dominant and most often based on Seaton Park or Daliak. These cultivars were released with sound agronomic credentials in terms of persistence characteristics (see paper II of this series) and seem to be in balance with the farm system and most soils and climatic variations of the region.

Trifolium species other than sub. clover, particularly rose clover (T. hirtum) and serradella are also grown successfully in this region.

Zone 3. Intermediate Lateritic
The varietal complexity of this zone can be related partly to the highly variable nature of the topography and soil type. Both dry hillside pastures and wet "Yarloop flats" are found in the locality. Pastures nevertheless are in generally sound condition and clover dominance is still the rule. Diseases such as clover scorch have not been generally severe in the zone.

Zone 4.
Subterranean clover pastures based on Dwalganup have been amongst the State's longest lived and successful in terms of clover dominance, with 30 to 40-year old Dwalganup-dominant pastures by no means uncommon.

Dwalganup seems in excellent balance with its environment but has been responsible for considerable loss of lambing performance in the region. This was the direct cause of release of Daliak as a Dwalganup alternative in this, the medium rainfall wheat-sheep zone.

In this context there are lessons to be learnt from the general lack of farmer acceptance of the new cultivar. Daliak is still being sown, but generally its rate of usage is
Table 1—The geographic distribution of subterranean clover varieties in Western Australia*

(See also Fig. 1)

<table>
<thead>
<tr>
<th>Zone (see fig. 1)</th>
<th>Rainfall (mm)</th>
<th>Approximate area of sub. clover (ha)</th>
<th>Main establishment period</th>
<th>Major varieties (at least 50% of sown pasture)</th>
<th>Other varieties in order of importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1—old south west</td>
<td>800–1 500</td>
<td>750 000</td>
<td>1920–1950</td>
<td>Mt Barker, Mt Barker/Woogenellup mixtures</td>
<td>Woogenellup, Yarloop, Dinninup</td>
</tr>
<tr>
<td>Zone 2—new west coast</td>
<td>500–800</td>
<td>250 000</td>
<td>1965–1975</td>
<td>Seaton Park, Daliak</td>
<td>Woogenellup, Dinninup, Dwalganup/Geraldton mixtures</td>
</tr>
<tr>
<td>Zone 3—intermediate lateritic</td>
<td>500–800</td>
<td>750 000</td>
<td>1930–1970</td>
<td>No predominant varieties</td>
<td>Woogenellup, Dinninup, Dwalganup mixtures, Mt Barker mixtures, Yarloop, Seaton Park, Daliak</td>
</tr>
<tr>
<td>Zone 4—old sheep and cereal</td>
<td>400–500</td>
<td>3 250 000</td>
<td>1935–1975</td>
<td>Dwalganup</td>
<td>Dwalganup/Geraldton mixtures, Geraldton, Dwalganup/Daliak mixtures, Daliak, Seaton Park, Yarloop, Dalpin (minor importance only—less than 5% in total)</td>
</tr>
<tr>
<td>Zone 5—dry wheatbelt</td>
<td>300–400</td>
<td>1 000 000</td>
<td>1955–1970</td>
<td>Geraldton</td>
<td>Geraldton/Dwalganup mixtures, Dwalganup</td>
</tr>
<tr>
<td>Zone 6—new south coast</td>
<td>500–700</td>
<td>500 000</td>
<td>1950–1970</td>
<td>Woogenellup</td>
<td>Yarloop, Seaton Park, Dinninup, Mt Barker, Bacchus Marsh, Mt Barker mixtures, Bacchus Marsh mixtures, Daliak mixtures, Yarloop mixtures, Mt Barker mixtures (minor importance only—less than 5% in total)</td>
</tr>
</tbody>
</table>

* The information is based on seed production and statistics and on the observations of pasture seed certification officers.

low and there appears to have been no major effort on the part of farmers over the last six years to replace their existing high isoflavone Dwalganup and Geraldton pastures.

The possible reasons for the low acceptance of Daliak have a bearing on prospects for a further low oestrogen cultivar in the area.

First, the acute clover disease phase seems to have abated, so reducing the farmer’s desire to resow with the new variety, particularly on his impressive-looking Dwalganup stands. Coupled with this is the fact that wool production is the major industry in the region and wool and sheep prices have been relatively low for many years.

Also, Daliak is a rather unimpressive looking variety and this tends to count against it, as did the run of dry seasons (1969-71) in which Daliak compared poorly with the earlier maturing Dwalganup.

**Zone 5. Dry Wheatbelt Zone**

The wheatbelt contains very few clover-dominant pastures. Unfortunately this is the area where clover dominance is most needed, but the poor seasons of 1969, 1970 and subsequent more intensive cropping systems have found Geraldton unable to persist satisfactorily—a direct contrast to Cyprus barrel medic based pastures on heavier soils in the area.

The replacement of cv. Geraldton, despite its previous invaluable contribution to farm production, is an obvious need in the area.

**Zone 6. New South Coast**

This zone once grew Australia’s best clover pastures but the last few years have seen dramatic changes in the condition of pastures in the area.

Woogenellup-based pastures especially appear to have suffered greatly from the effect of clover scorch and have been rapidly invaded by grasses and capeweed, with a marked loss of carrying capacity (B. J. Goddard, private communication).

Although Yarloop, Seaton Park and Dinninup, with their high hard seed reserves, have generally retained their dominance, all cultivars now grown in the area, except Daliak on the drier margins, need
replacement. There is a particular need for a clover scorch resistant cultivar of about Woogenellup maturity.

In brief...
The subterranean clover situation has changed rapidly over the last few years, not always for the better. There is no doubt that this is still the major pasture species of Western Australia, or that there has been some acceptance of varieties introduced some six or seven years ago. On the debit side the overall seed usage is well down, even allowing for the effects of rural recession. Also there is a suggestion that farmers, in some districts at least, no longer have the same confidence in subterranean clover. They doubt its ability to handle the new problems of the last few years, particularly in terms of persistence through droughts and resistance to disease. Farmers reactions to subterranean clover cultivars over the past few years must be taken into account in future breeding, selection, testing and release of new cultivars. At the same time farmers should keep in mind the value of subterranean clover in Western Australian farming systems and make the best use of existing cultivars, and of new cultivars as they are released.

References