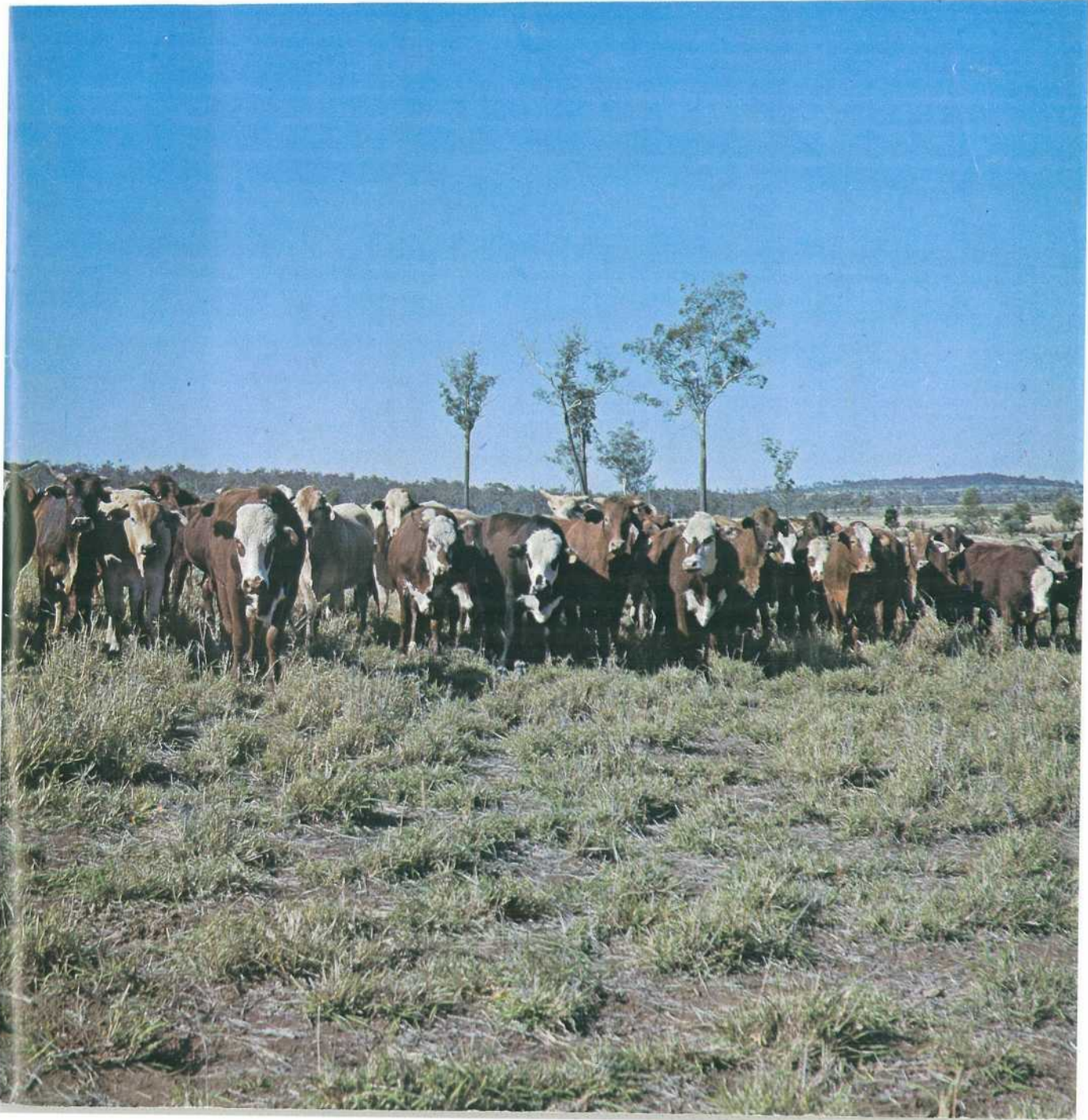


Queensland
**AGRICULTURAL
JOURNAL**

JULY 1976 Vol. 102 No. 4



Brigalow in Queensland

The Brigalow tree is a member of the Acacia family. It has no commercial value and is of limited use to the landholders. It grows profusely, often with other timber types, in scrubs so thick that there is generally little grass of any fodder value.

As well as tap roots, brigalow trees have a lateral root system which stores vast quantities of starch. If the tree is damaged in any way, or cut down, these lateral roots will send up myriads of suckers and the result is a more dense scrub than the original.

In the early days of Land Settlement in Queensland settlers preferred the open forest and grassland to the dense scrubs. They even fenced off the patches of scrub so mustering stock would be easier.

However, the few who managed to clear some of the scrub found that the soil there was generally more fertile than in the more open areas and this led landholders to persevere with their efforts to overcome the sucker problem.

It was only since World War II with the availability of heavy machinery and the use of aircraft to sow seed and/or spray suckers that a successful method of attacking the problem was devised.

The scrub is literally 'pulled' over by two heavy tractors linked together by a 2 inch heavy steel cable and/or chain and moving in unison about 30 metres apart. Not all the trees are destroyed. Suitable areas of timber are left in the natural state to provide the very necessary shelter, shade and windbreaks.

The land is left for about 12 months and the fallen timber is then burnt. The fire, burning the dead trees and whatever grass that has grown usually attends to the first 'wave' of suckers. As soon as the ashes are cold the area is seeded by aircraft with grass seed, usually a mixture of Buffel, Green Panic, Rhodes and others. Then with the first rain the new grass is ready to compete actively with any more suckers. With possible further burning and aerial spraying with hormone weedicides the

battle against the suckers is tipped in favour of the landholder. It is the large scale operation that makes use of aircraft possible.

The land is ready for stocking about 12 months after the first sowing of pasture. In the better rainfall areas the brigalow land is admirably suited for growing of grain and fodder crops.

With a successful method devised and following surveys by officers of Commonwealth and Queensland Governments, the State embarked on a scheme to bring into production a vast area of that part of Central Queensland known as the Fitzroy Basin.

The Scheme using money supplied by the Commonwealth under loan, at first operated in 1962, in priority areas I and II comprising 2.02 million hectares. When development of these areas was successfully under way further negotiations were entered into with the Commonwealth for the development of Area III, a further 2.5 million hectares.

In addition to the monies advanced to settlers for clearing and development of the scrub, provision of water facilities, fencing and the like, money was also made available to Local Authorities on a 75% subsidy 25% loan basis, for the provision of access roads.

The scheme has been an outstanding success. Cattle in the area at the outset numbered in the vicinity of 300 000 and now the estimated carrying capacity is 1 000 000 cattle.

In all, 77 blocks of land were sold at auction, 170 blocks were disposed of at ballot and 113 were retained by landholders whose surplus lands were acquired by negotiation.

The whole area has a network of roads at least to gravel standard and every block has an access road.

Our cover shows cattle grazing on pasture established on cleared brigalow land.

QUEENSLAND AGRICULTURAL JOURNAL

Published every second Month by Department of Primary Industries, William Street, Brisbane 4000.
Telephone 224 0414

Vol. 102 No. 4

JULY-AUGUST 1976

EDITOR: David K. Wheatley

Contents

Director-General Retires 322	Burning Off—planning and costs 345 <i>by N. A. Scott</i>
Vibra packing of citrus 323 <i>by K. B. McRae</i>	Identifying insects—Thrips 349 <i>by I. D. Galloway</i>
Of particular interest 327 <i>Statements by the Minister for Primary Industries</i>	Tomato Diseases 355 <i>compiled by J. E. C. Aberdeen</i>
New interest in an old weed 330 <i>by Selwyn L. Everist</i>	Maize varietal planting guide 1976-77 season 382
Tropical legumes increase milk production 331 <i>by officers of Dairy Cattle Husbandry Branch</i>	Soybean Varieties—1976-77 season 386
It pays to start lactation off well 334 <i>by M. R. Maroske, G. W. Brown and E. M. Ottosen</i>	Grain sorghum planting guide 1976-77 season 389
Simmental-Hereford Crossbreeding Studies 337 <i>by P. B. Hodge</i>	Brucellosis-tested swine herds 396
Sparganosis . . . a parasitic problem in feral pigs 339 <i>by P. L. Appleton and J. H. Norton</i>	Chemical Weed Control Guide—Summer crops 1976 397
Efficiency of Anti-bruising Crate Questioned 344 <i>by W. R. Ramsay</i>	Cookery—The Sunday joint 412
	Mature Cheese—savings in storage costs 415 <i>by J. R. Dulley, Dairy Research Branch</i>

QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES

Director-General retires

Statement by

*The Hon. V. B. Sullivan, M.L.A.,
Minister for Primary Industries*

Dr. J. M. (Jim) Harvey, one of Queensland's best-known and most respected Government administrators and agricultural scientists, is to retire after 43 years' service with the Department of Primary Industries.

Dr. Harvey, who has been Director-General of Primary Industries since 1965, began his retirement leave in July and officially relinquishes his post on October 18 this year.

Dr. Harvey has been the guiding force for more than a decade of a Department which serviced primary industries throughout the State which now has a gross production value of more than \$1,200 million a year.

He performed this job with a high degree of efficiency and understanding.

During his long and distinguished career, Dr. Harvey has travelled extensively throughout Australia and overseas, firstly to study research developments and, later, as a representative of the Queensland Government at top-level agricultural conferences.

He is recognised as an expert in the field of biochemistry and nutrition of livestock.

Dr. Harvey was a brilliant student and, early in life, showed his scientific bent by winning the science prize at the Brisbane Grammar School.

He joined the Department as a cadet chemist in 1933, rose to Biochemist in 1956 and deputy Director-General early in 1965.

Later that year, following the death of Mr. W. J. S. Sloan, he was appointed Director-General.

Dr. Harvey was awarded his Bachelor of Science degree in 1934, Master of Science two years later and Doctor of Science degree in 1954.

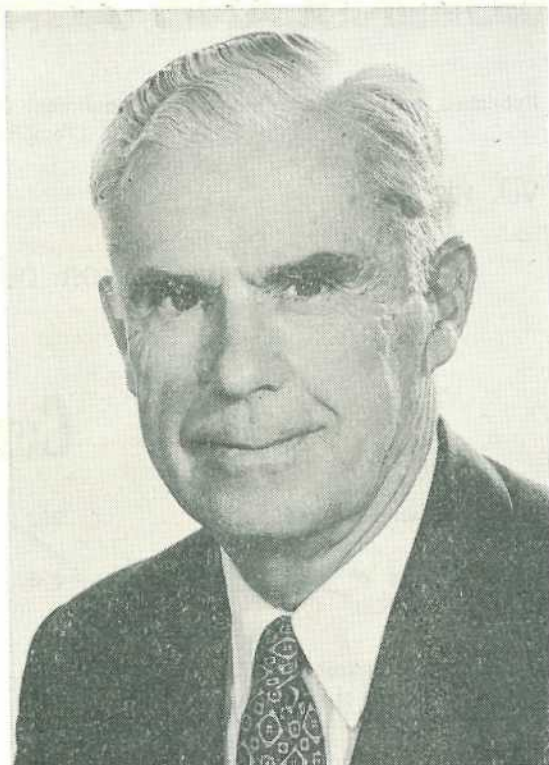
During World War 2, he served as a pilot with the Royal Australian Air Force overseas, attaining the rank of Flight-Lieutenant.

As permanent head of the Department and my chief adviser, Dr. Harvey has been responsible for organising a Department which operates in every corner of the State.

He has maintained close, and valuable contact with Commonwealth and State Agriculture Departments, industry bodies and scientific institutions.

Among the many bodies on which he has served are the Standing Committee on Agriculture, C.S.I.R.O. Executive, University of Queensland Senate and Sugar Experiment Stations Board.

Dr. Harvey's outstanding contribution to rural industry has earned the best wishes of a wide circle of friends and associates throughout Australia for a long and happy retirement.



Dr. J. M. (Jim) Harvey

Vibra packing of citrus

by K. B. McRAE, District Adviser, Horticulture Branch.

WHILE some citrus growers and packers are troubled by the high labour costs involved in preparing citrus fruits for market, many Queensland growers are now using a simple and effective technique to reduce these costs substantially. These growers have been making use of the vibra-packing technique to pack their crops.

"Vibra-Packing" is the name coined by the Department of Primary Industries for a new technique which semi-mechanises the packing of fruit. It needs fewer packers than the old hand-packing technique and the packing is done much more quickly.

Benefits

Citrus growers and packers who have changed to vibra-packing have been enjoying an average saving of 60% of packing time and labour costs.

At the price of labour today this means a saving of around \$150 for each 1 000 cartons of fruit packed. When it is realised that this is a clear saving from which no other costs such as transport, agents fees or levies need be deducted, the true worth of the vibra-pack system can be appreciated.

In addition to cost savings, vibra-packing allows a quicker movement of fruit through the packing shed. This is particularly appreciated in family operated packing sheds where vibra-packing can considerably ease the strain of a busy harvesting season.

Because vibra-packing is a new technique, and the appearance of the pack is slightly different from that of hand packed fruit, some initial market resistance to vibra-packed fruit was anticipated. In practice this resistance has proved to be less than expected. Where the

vibra-packing technique has been properly carried out and firm neat packs produced, market acceptance has been very good. Growers who use the new technique are usually obtaining market returns equal to those received for comparable fruit packed by the old hand place-pack method.

How it works

The vibra-packing system reduces costly packing labour time by eliminating the need for packers to handle fruit individually while placing it in neat rows in the market packages.

Instead of being packed by hand, the cartons are simply filled with a measured quantity of fruit, without necessarily trying to form a pattern. The filling may be done direct from the accumulator bins by hand, or via a hand operated chute and gate, or most effectively, by using an automatic weight filler.

Once filled, the cartons are subjected to a total of about five seconds of gentle vibration on a vibrator table. This consolidates the fruit to form a firm full pack and the fruit take up a neat arrangement as they settle in the carton. While this pack may not be quite a neat in appearance as a hand place-pack, it is of surprisingly good appearance. The vibration treatment causes no more damage to fruit than does the treatment during hand place-packing.



Automatic weight fillers have replaced some of the rotary bins on this fruit grader. This equipment reduces carton filling time and labour costs. The filled cartons are then vibrated to consolidate the pack.

The face of fruit nearest to the vibrator table forms the neatest pattern. Cartons are therefore filled and vibrated in the upside-down position so that the top layer of fruit in the carton will present the best appearance.

To improve the appearance of the top layer still further, some packers have place-packed the first layer, and then loose filled the remainder of the carton before vibrating it. This first layer finishes up as the top layer. The resulting pack looks every bit as neat as a hand packed carton. This extra step is regarded as an interim measure only, to be used during the introduction of vibra-packing.

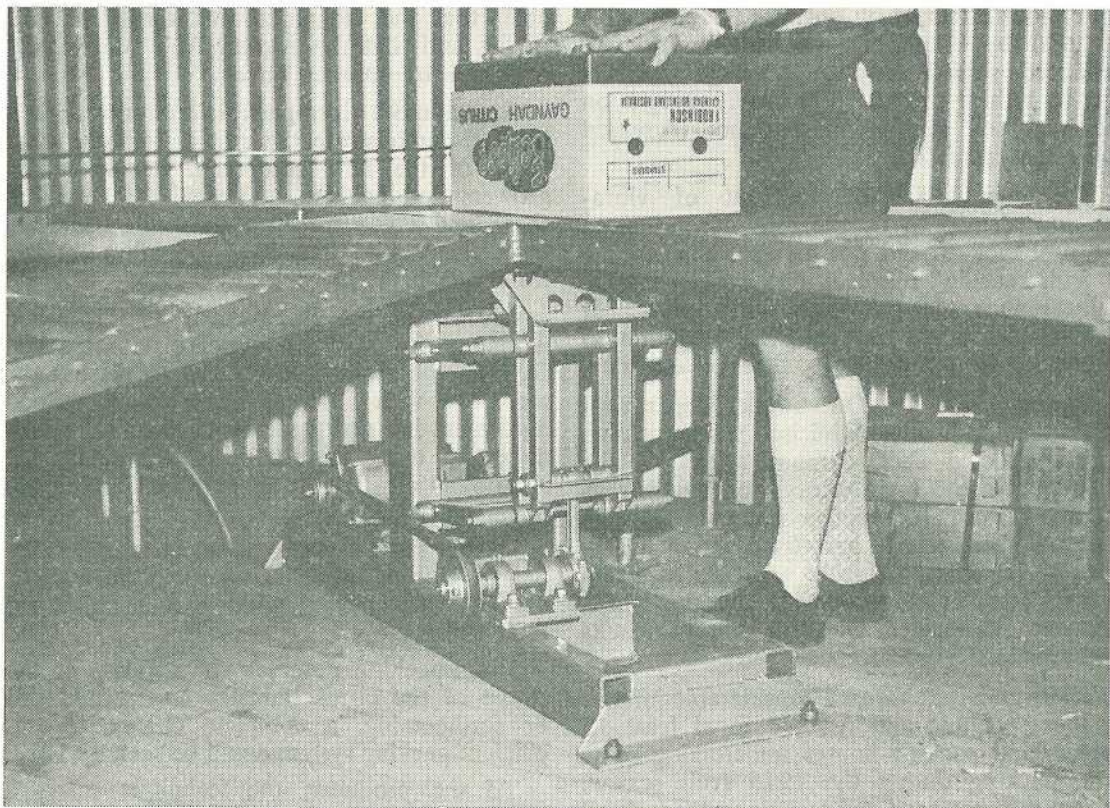
The simplest method of measuring fruit into a carton before vibrating it, is to weigh it in, and this is the commonest practice. A weight/count relationship is then determined for each

fruit size so that the actual count of fruit can be marked on the carton. The alternative is to actually count the fruit into the carton but suitable electronic counters are very expensive and only warranted in large packing sheds.

Equipment is simple

The equipment needed to convert a conventional packing shed to one for vibra-packing, is simple and not costly. Most of the necessary items such as the vibrator table and the automatic weight-fillers can be constructed easily on any orchard where reasonable workshop facilities are available.

Most Queensland growers and packers have constructed their own vibration and automatic weight filling equipment, tailoring these to suit their other existing packing shed equipment.



A well constructed vibrator in operation. The carton is filled and vibrated in the upside-down position.

The inventiveness of many growers has resulted in several design improvements, particularly to weight fillers. A variety of equipment has now been developed to suit almost any possible packing shed layout or fruit sizer type.

Equipment costs for shed conversion have not been great. By building their own equipment, growers have found the cost to range from several hundred dollars for a small shed, to around \$2,000 for an average to larger sized shed. Experience has shown that this capital outlay is recouped from the savings made in labour costs within the first six weeks of operation. This makes the conversion a very attractive financial proposition.

How Vibra-Packing developed

The idea of semi-mechanising fruit packing, using vibration to develop a firm pack, originated in the United States of America. Mr.

D. Schoorl of the Queensland Department of Primary Industries, and other researchers in Australia, subsequently carried out successful trials with the vibra-packing of citrus. Some vibra-packing of tomatoes has also been done in Queensland.

Early in 1974, the Queensland Department of Primary Industries decided to adopt a programme to encourage citrus packers to change to vibra-packing and to promote the acceptance of vibra-packed fruit on all Australian markets. This decision was made because it was realised that the citrus industry was facing a difficult financial situation.

Citrus growers were being forced to absorb sharply rising costs, particularly in the area of labour for picking and packing. Very little compensating rise in fruit prices was evident. As a result the profitability of orchards and packing sheds was seriously threatened.

Previous attempts by growers to relieve this situation by increasing the volume of fruit produced served only to overload markets and to reduce prices. The profit margin on the increased production was not increased and often decreased.

The commercial development of vibra-packing seemed to be the logical solution to the problem. It did not increase the volume of fruit reaching markets, but it did substantially reduce the grower-packer's costs. It also simplified the fruit packing operation so that more fruit could be packed in less time.

During 1974, the Queensland Department of Primary Industries publicised vibra-packing, and conducted shed demonstrations of the technique in the main citrus growing districts of the State. Experience obtained by one packing shed which had tried using vibra-packing on a limited scale was also assessed. Several commercial trials with vibration packing were conducted and the market results and reactions were assessed.

These activities aroused considerable interest in the technique and resulted in at least 15 Queensland packing houses undertaking some vibra-packing during the 1975 fruit season. A few growers used the technique to pack all of their crop.

Vibra-Pack now widely accepted

By the end of the 1975 season, it had been clearly established that vibra-packing was work-

able, that the technique was time and cost saving and that the packed fruit was readily accepted by market buyers.

Several more vibra-pack field days were then held to demonstrate the system further, using some of the new equipment developed by growers and packers. Particular features of these field days were the enthusiastic addresses by growers who had used the vibra-packing technique in 1975.

Officers of the Department also travelled interstate in 1975 to observe vibra-packed fruit on the main markets and to discuss the technique with all interstate persons. Good agreement has now been reached on the desirability of using vibra-packing throughout the Australian citrus industry and some states are already using it.

During the 1976 season an increased number of Queensland packing sheds have made use of vibra-packing with some using it for their entire crop.

Vibra-packing deserves the support of the whole of the citrus industry and should this be forthcoming, a complete change to this efficient packing system could be seen by 1977.

To the producer, the technique offers a means of reducing the effects of rising costs, allowing him to retain profitability without the need for greatly increased fruit prices. To the fruit seller and consumer it should be seen not only as a new and interesting packing system, but also as a genuine contribution by the citrus industry towards the breaking of the inflationary spiral.

Empty containers

BEFORE disposing of any empty pesticide containers, ensure that they are rinsed at least twice with water, and that the rinsing water is preferably added to the spray tank to avoid waste of pesticide and money.

Double rinsing will remove the greatest portion of the container's contents.

By courtesy Agricultural and Veterinary Chemicals Association.

Of particular interest

Items of news recently released by the Minister for Primary Industries, the Hon. V. B. Sullivan, M.L.A.

Land Resource Surveys

THREE branches of the Department of Primary Industries will carry out land resource surveys in western Queensland from May to September this year.

The areas to be surveyed are Barcaldine-Longreach-Winton as well as Charleville-Cunnamulla.

Officers of the Development Planning, Botany and Agricultural Chemistry Branches will carry out field work to determine soil and vegetation types, land types and land use suitability.

The aim of the survey is to classify the various land types of western Queensland into units having similar characteristics.

Particular attention will be paid to pasture composition and productivity, soil fertility, poisonous plants and soil and plant problems arising from using these areas.

The next stage will be to work out recommended practices for land and animal management suitable for each land type.

This is aimed at ensuring the continued life of the grazing industry and the long-term productivity of the land types.

The recommendations will be based on both experience and research.

The Departmental team will be working in co-operation with officers of the Lands Department, CSIRO Division of Land Resources Management and the Bureau of Agricultural Economics.

Local landholders will be consulted whenever possible during the survey.



Already 29 million hectares of land in south-western Queensland have been covered by a similar survey.

The surveys this year are a continuation of this programme, which is based on a request by the Central and Northern Graziers' Association when wool prices were very low.

Committee to enquire into Queensland Dairy Industry

DEVELOPMENTS in the Queensland dairying industry are to be examined by a Committee of Enquiry.

Recent developments in both domestic and export markets have made necessary a thorough examination of the whole marketing structure and organisation of the industry.

Massive surpluses of skim milk powder have built up in Europe as a result of agricultural policies being pursued by the European Economic Community.

With export outlets now severely limited and prices at very low levels, a substantial surplus of powder has built up in Australia and this was causing considerable difficulty for the industry.

It appeared most unlikely that the position will improve in the foreseeable future.

A further complication has arisen from a decline in fresh milk consumption.

This is hindering our ability to extend the benefits of market milk quotas to more dairy-farmers.

A three-man Committee will be appointed as soon as possible and will have the powers of a Commission of Enquiry.

It will be authorised to look into all aspects of the dairying industry in Queensland and the place of the Queensland industry in the overall Australian scene.

The Australian Agricultural Council considered the problems arising from the depressed export market situation at a special meeting in Sydney on May 14.

The Council agreed on certain guidelines aimed at restraining production to a level which can be absorbed.

These guidelines include a study of measures to assist dairyfarmers, who so wish, to leave the industry, suspending the issue of new dairy farm licenses, and stepping up the eradication of brucellosis and tuberculosis in dairy herds.

A lot has already been done in Queensland in recent years to improve the efficiency and structure of the industry.

The proposed Committee of Enquiry will review the whole situation and make recommendations on where we should go from here.

Beef Industry recommendations benefit Graziers

GRANTING of a tickicide subsidy recommended by the Queensland Government-appointed Beef Industry Committee has brought a \$1 million benefit to beef producers.

This has been a real factor in reducing the immediate costs of production, since large numbers of cattle needing regular cattle tick control were still being held in Queensland.

Dipping is still necessary, despite advances in research into biological control through the development of tick-resistant animals.

Biological research is a long-term measure.

Beef producers also have been granted rail freight concessions.

A reduction of 25% off the normal rate applies and, with the turn-off of cattle running at a record level, this is a substantial benefit to producers located far from slaughtering facilities.

The Committee, of which I am chairman, has been very active since its formation in recommending a number of measures designed to benefit the hard-hit beef industry.

These include:—

- Suspension of the 1c a lb. inspection fee on export meat, eligibility of primary producers to receive unemployment benefits and assistance towards meeting education costs for the children of producers, or their employees.
- "Carry-on" finance, at an interest rate of 4% for the first year plus a repayment "holiday", are still available to eligible beef producers through the Rural Reconstruction Board.

The Committee closely examined all beef marketing schemes which were submitted to it, in addition to schemes already operating in other areas.

All contained drawbacks of one type or another, and none offered a completely acceptable solution.

The Committee has formed a Working Group to explore every possible avenue in an effort to devise an acceptable scheme.

The Committee, at its recent meeting in Brisbane, stressed the need to achieve stability in the domestic market at a price which was fair both to producer and consumer.

The Committee supported a recommendation by the United Graziers' Association for re-structuring the Australian Meat Board.

The State Cabinet subsequently considered the Committee's recommendations and an approach has been made by the Premier, Mr. J. Bjelke-Petersen, to the Prime Minister, Mr. Fraser, seeking changes in the composition and functions of the Board.

This move is designed to improve returns from sales of beef overseas and to give producers greater influence on the Board's decisions.

The Committee also strongly supports the early introduction of classification of beef carcasses as a further aid to better marketing.

Another Working Group is responsible for examining possible means of expanding local sales of beef by making it available to potential customers now unable to buy through the current outlets.

I have been interested to hear some forecasts that the situation in the beef industry will improve considerably by the end of this year.

I hope they are correct, but we cannot afford to ignore other forecasts which predict little significant overall improvements for at least another 18 months.

The Queensland beef industry is too important, and has too much potential, to be allowed to disintegrate.

It is essential that producers, whether they be operating in a large or small way, be maintained in the industry.

Sale cattle must be branded

SOME stockowners apparently are not aware that cattle weighing more than 100 kg (220 lb.) liveweight must carry a brand when offered for sale.

The biggest problem has arisen with unbranded calves close to weaning which have been sold with their dams.

Owners should brand all calves close to weaning before movement should they be in any doubt as to their weight level.

Exemptions have been granted for stud cattle identified to meet stud book requirements but not to commercial animals.

To study stored grain pest problem controls overseas

EXPORT markets for cereal grains demanded a product completely free from insect infestation.

This was difficult to achieve in Queensland's warm climate because strains had developed which were resistant to the standard malathion grain protectant.

Alternative control measures were required urgently.

Dr. M. Bengston, the assistant Director of the Entomology Branch of the Department of Primary Industries, is to spend two months from July overseas to study stored product entomology and newer methods of pest control.

During the past three years, he has convened an Australian Working Party involving officers of CSIRO, Commonwealth and State Departments and Australian and State Wheat Boards.

The group has field-tested successfully alternative new grain protectants in all mainland States but they cannot be used until international approval of residues is obtained.

Dr. Bengston would outline these results to the 15th International Congress on Entomology in the United States in August.

The crucial decision on residues would be made by the Food and Agriculture Organisation in October.

Dr. Bengston also would visit research centres in the U.S. and Canada.

Cost of the tour would be paid by the Australian Wheat Industry Research Council and certain chemical companies.

CHANGING YOUR ADDRESS?

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Because the addressed wrappers and journals are printed separately, changes cannot take effect until the next batch of wrappers is printed.

This means that, in some cases, subscribers will receive the next issue at their old address.

If possible, two months notice should be given to ensure your journal is sent to the correct address.

New interest in an old weed

Petty Spurge (*Euphorbia peplus*)

by SELWYN L. EVERIST, former Director of Botany.

A RECENT article in the Medical Journal of Australia has been widely reported in the popular press and has revived interest in a widespread weed with an age-old history of use in folk medicine.

This note and illustration are published for the benefit of many people who have enquired about the appearance and properties of this plant.

The plant in question is the petty spurge, a small annual that is native to Europe but is now widely distributed in nearly all countries including Australia. It usually grows in shady places such as glasshouses, ferneries and shaded garden beds.

It is an erect herb, usually 15–30 cm (6–12 inches) high with a single stem that branches repeated towards the top and spreads out into the shape of a miniature tree. The leaves are rounded in outline, tapered at the base into a slender stalk, thin and soft in texture and pale green in colour. They are arranged alternately on the main stem but become smaller and are grouped in opposite pairs on the upper branches.

The flowers and fruits are very small, greenish and borne in the forks of the upper leaves. The whole plant exudes milky sap when cut or broken. This sap is very irritant to tender body surfaces and can produce temporary blindness if it gets into the eyes.

For many centuries, the milky sap has been used by some people to treat warts, "rodent ulcers" and small skin cancers. Many cases of "cures" have been reported but until

recently no medical proof of efficacy has been published.

In an article in the Medical Journal of Australia, Drs. D. Weedon and J. Chick of Brisbane reported on a case where a patient had treated a skin tumour on his chest with the sap of petty spurge.

The nature of the original lesion as basal cell carcinoma was confirmed by microscopic examination of a tiny specimen cut from one edge of the tumour. The patient applied the milky sap to the tumour each day for five days. The treated area became inflamed and pustular and finally the whole lesion sloughed off. Six weeks after treatment, further microscopic examination of a piece of scar tissue showed the presence of a few chronic inflammatory cells but no evidence of residual tumour.

The authors commented that their finding should in no way be taken as a recommendation for this form of therapy.



Tropical legumes increase milk production

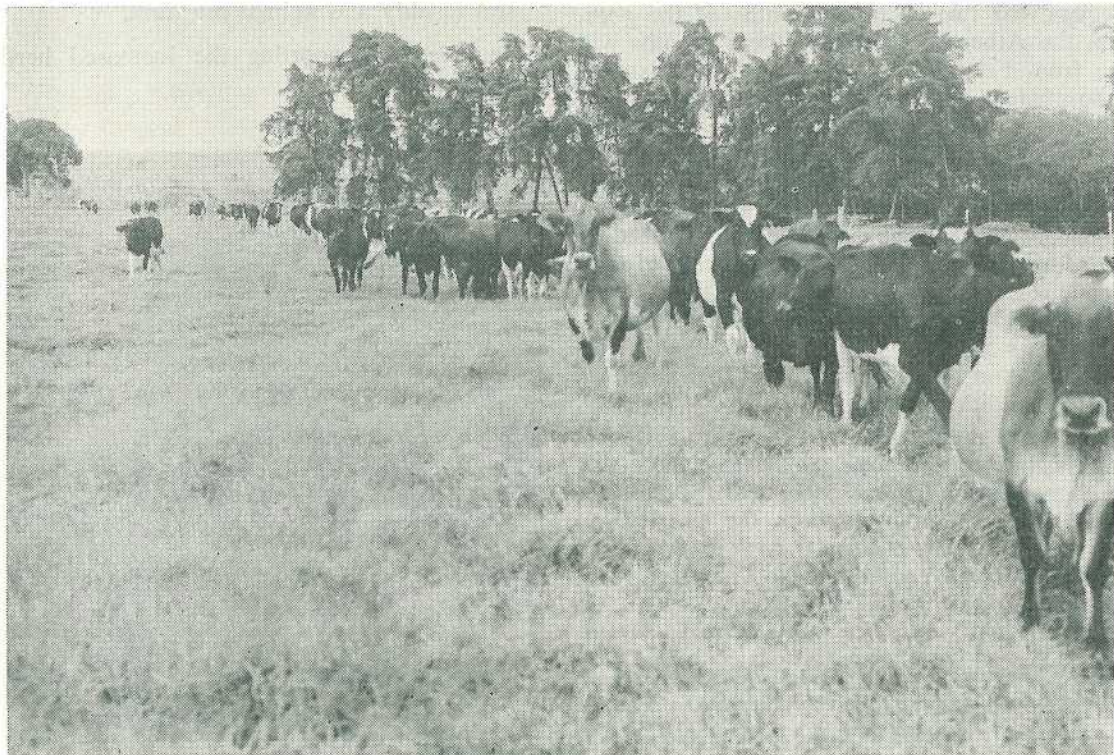
by Officers of Dairy Cattle Husbandry Branch,
Kairi Research Station.

PASTURE legumes have increased milk production of cows in tropical Queensland, but there is a limit to their carrying capacity.

In the early 1960s a number of new tropical legumes were released for use by farmers in Queensland. Twining legumes such as glycine (*Glycine wightii* cv. Tinaroo) had demonstrated they could thrive under the climatic conditions on the Atherton Tablelands and certain other localities throughout the state. They held promise of being able to produce abundant pasture of very high quality for grazing cows.

During this period farmers responded to rising costs by milking more cows, and so increasing the pressure on pastures. Because of the unique ability of legumes to fix nitrogen, a pasture containing legume could reduce costs for nitrogen fertilizer yet maintain pasture yield. More cows might be carried without an increase in fertilizer costs.

The number of cows per hectare is the most important factor affecting legume content of a mixed grass-legume pasture.



Because of the importance of legumes to the dairy industry, experiments have been carried out on Kairi Research Station to study the role of tropical legumes in pastures.

Role of legume

The legume has two major roles in a grazed pasture:

- the nodules on legume roots use atmospheric nitrogen and transfer this to the main legume plant. When the legume returns to the soil, either through decaying leaves or cow faeces, the amount of nitrogen available to the grass is increased.
- the legume forms a high quality part of the cow's diet. If a cow is able, she will eat more legume than grass and this legume has a high crude protein content. The digestibility of the legume is usually high.

The pasture must have a high legume content for these two roles to be filled. A low legume yield, less than 10% of the pasture, has very little effect either on the cow's diet or on nitrogen supply to the pasture. The optimum legume content is probably reached when the pasture contains approximately 50% legume for two to three months of the year. On the Atherton Tableland these months will be from February to May. Adequate superphosphate is essential to maintain a high legume content in pastures on the Atherton Tableland.

Milk production

When green panic (*Panicum maximum* var. trichoglume) glycine pastures were grazed at 1.0 to 1.3 cows per hectare the glycine remained vigorous and in May and June reached 70% of the pasture on offer to cows. The cows averaged 4 000 kg milk over a 300 day lactation and were always in forward store or fat condition.

As cow numbers increased from 1.0 cow per hectare to 2.5 cows per hectare there was a change in the legume content of the pasture. The higher the cow numbers, the less legume there was in the pasture. At 2.5 cows per hectare legume content never exceeded 15% of the pasture on offer to cows.

Two factors were now acting to reduce milk yields:

- there was less nitrogen available to maintain the growth of grass.

- there was less legume to contribute to the cow's diet.

The high grazing pressures with a large herd meant pasture was never able to build up a large body of feed and cows were constantly restricted in their pasture intake.

Milk yields fell to 3 100 kg per lactation at 2.5 cows per hectare and cows were often very poor in condition. Hand feeding of maize or silage was needed in two years out of four.

Despite the fall in milk production per cow, production per hectare kept increasing as cow numbers rose. At 1.0 cow per hectare average production was 4 000 kg milk per hectare per year, and this increased to 7 750 kg per hectare per year at 2.5 cows per hectare.

Practical stocking rates

It was necessary to decide on a practical stocking rate for these pastures. At this stocking rate the legume content of the pasture had to be:

- stable from year to year.
- high enough to contribute significantly to soil fertility and animal nutrition.
- capable of supporting the increased herd numbers.

A high legume content in the pasture will provide a high quality diet for grazing cows.



After examining the experimental results it was decided 1.6 cows per hectare was the most practical stocking rate for green panic-glycine pastures. Other pasture mixtures with legumes of similar habit to glycine would also be likely to sustain this stocking rate.

Benefits

At 1.6 cows per hectare legume content reached a maximum of 40%, but cows were in good condition and the pastures were stable. Milk production per cow and per hectare were 3 700 kg and 5 920 kg per year respectively.

Higher stocking rates can be carried if supplementary feed is used to reduce the grazing pressure on pastures. For example, if cows graze irrigated pasture for part of the year, dryland grass legume pastures can be shut up and spelled for 3 to 4 months. The spelling allows time for the legume to recover from heavy grazing during the summer. With this management system 2.5 cows per hectare can be carried through the summer on grass-legume pastures.

Grazing Management

There is wide scope for a farmer to choose his own system of grazing management for these pastures. Experiments have shown that continuous grazing of large paddocks causes no more serious defoliation of the legume than rotational grazing of small paddocks. At high stocking rates strip grazing causes very severe defoliation of the legume.

Most farms are divided up into paddocks. A constant rotation of cows around paddocks, leaving them in each paddock for 2 to 4 grazings, could be a suitable grazing management strategy.

Conclusions

Pastures based on twining legumes can consistently produce 3 700 kg milk per cow per year and maintain 1.6 cows per hectare per

year. Beyond 1.6 cows per hectare legume growth will be reduced and prolonged spelling will be necessary to allow the legume to recover. The grazing management of these pastures can be adjusted to suit any particular farm.

Further details of these Kairi experiments and advice on management of grass-legume pastures can be obtained from the dairy officers, Department of Primary Industries, Malanda.

*FOR THE FRUIT AND
VEGETABLE
GROWER*

Queensland Agricultural and Pastoral Handbook

(Volume 2)

Available from
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Primary Industries,
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(within Australia and Territories)

Although published in 1961, this book, which deals with all fruits and vegetables grown in Queensland contains information still of great value.

732 pages—425 illustrations

It pays to start lactation off well

by

M. R. MAROSKE, G. W. BROWN, E. M. OTTOSEN,
Dairy Cattle Husbandry Branch,
Research Station, Kairi.

FOR a cow to produce a large quantity of milk it is essential that she be given a good start to lactation. The starting yield will depend on body condition before calving as well as her feeding in early lactation.

The importance of high starting milk yields has been underlined by results obtained at Kairi Research Station with Friesian cows grazing green panic-glycine pasture and supplemented with maize.

Energy requirements

A cow's requirements for energy changes considerably during a year. Following calving the requirement increases sharply from the cow's dry state because more energy is needed when milk production gets under way. Peak energy need coincides with the peak milk yield which occurs about 6 weeks after calving. This energy requirement declines as milk production falls throughout the lactation, but gradually increases again as the cow approaches the later stages of pregnancy. At this stage the unborn calf requires more nourishment from its mother.

Pre-calving

The period before calving is a critical stage in preparing the cow to produce large quantities of milk during her lactation. The preparation should enable the dry cow to—

- nourish her unborn foetus which makes its greatest growth and final development in the last 3 months before calving.

- maintain her body fat reserves as these will be used to produce milk later in the lactation.

Cows which are allowed to graze good quality pasture during their dry period will be able to meet the demand for extra energy needed during early lactation. When pasture is scarce it is necessary to feed moderate levels of grain or molasses to maintain body condition.

A weight gain of 0.5 kg per day in the last month before calving will be sufficient for a cow in forward condition to adequately maintain fat reserves.

For cows in backward condition it will be necessary to either:—

- start their weight gain earlier

OR

- ensure a greater daily gain of 0.6 to 0.7 kg per day during the last month before calving.

There is no advantage in having cows overfat at calving. Provided they are in moderate condition at calving and fed sufficiently after calving they will be able to express their potential for milk production. Overfatness often leads to problems at or just after calving. In some areas overfat cows are prone to milk fever attacks and unless immediate treatment is given mortalities do occur.

Post Calving

A cow producing 20 kg milk per day needs to eat 90 kg of fresh tropical pasture each day to supply the energy required to produce this milk. Her limited gut size prevents her from consuming this amount of pasture in a day so the energy will have to come from other sources if full potential milk yields are to be obtained. This energy can either—

- be added to her diet through high energy supplements such as grain or molasses

OR

- come from body fat reserves.

Grain feeding in early lactation

Pastures, especially tropical species, are bulky and have a high fibre and moisture content. The cow's limited gut size prevents intake of sufficient pasture to allow her to express her full potential for milk production in early

lactation. Feeding a high energy supplement such as maize or molasses will allow her to increase her energy intake with only a small increase in stomach contents.

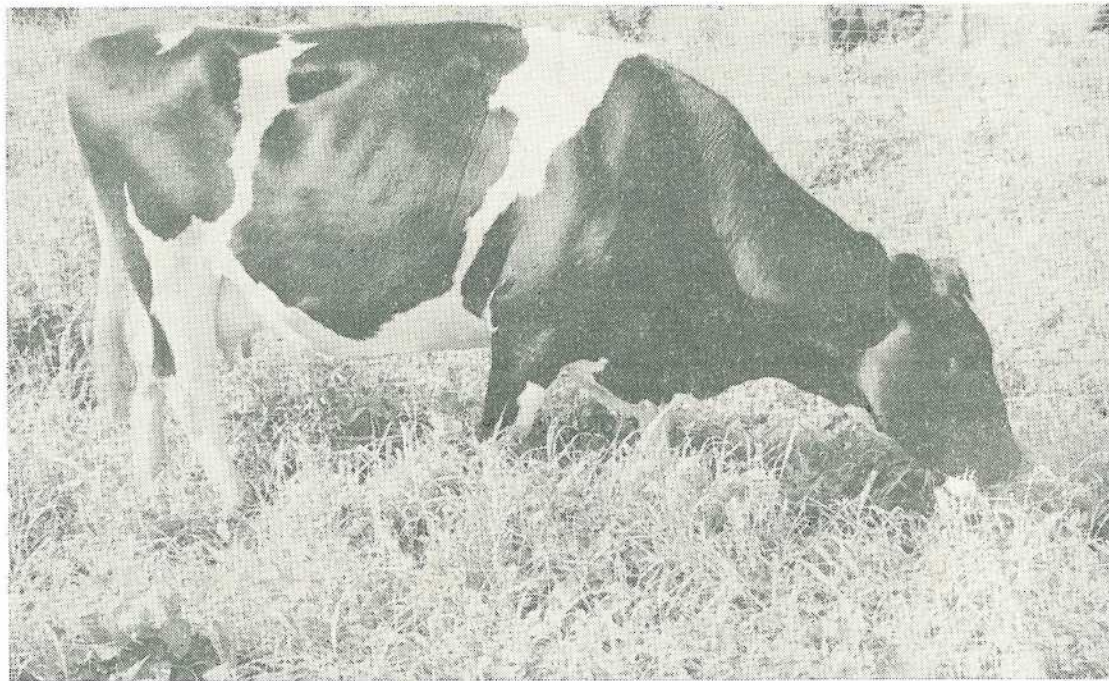
In the first 3 months after calving the cow is at her maximum potential to respond to increased energy in her diet. When high energy supplements are fed during this period the cow is more capable of response than in the later stages of lactation.

Experimental results

To examine the response to high energy supplements in early lactation an experiment was conducted at Kairi Research Station in 1971 and 1972. The aim of the experiment was to measure the milk yield response to an energy supplement fed in the first 50 days of lactation.

The experiment involved four different stocking rates. These were 1.3, 1.6, 1.9 and 2.5 cows per hectare.

Most efficient use of pasture is made when a high energy supplement (grain or molasses) is fed in early lactation.



These stocking rates are equal to and above the range used in commercial practice on the Atherton Tablelands, where good quality grass-legume pastures can carry 1.6 cows per hectare compared with the district average of about 0.9 cows per hectare.

There were 40 Friesian cows used in the trial with 10 cows allotted to each treatment.

Within each group of 10 cows, half were fed 3.6 kg hammer-milled maize per day for the first 50 days after calving.

During the first 50 days when maize was being fed the milk yield response was similar at all stocking rates and averaged 2.3 kg per cow per day. This shows that each kilogram of maize raised milk production by 0.64 kg per cow per day over this period.

Maize also had a residual effect on milk production over the whole lactation.

At the light stocking rate of 1.3 cows per hectare the response to maize feeding was 3.1 kg milk per kg of grain compared with a response of 0.4 kg milk per kg of grain at the heaviest stocking rate of 2.5 cows per hectare.

At the light stocking rate more pasture was available than at the higher stocking rates. When grain feeding stopped after 50 days the cows in the lightly stocked groups were able to eat pasture to satisfy their appetite and milk production was maintained. At the high stocking rates a shortage of pasture caused milk production from both supplemented and non-supplemented groups to fall quickly.

This meant that the carry over effect of maize feeding was much less at the high stocking rate.

The average lactation yields (kg of milk) of cows in the trial are shown in Table 1.

TABLE 1
MILK YIELDS (KG) OF TRIAL COWS

Stocking Rate (cows/ha)	1.3	1.6	1.9	2.5
Treatments—				
No maize	3 811	3 345	3 388	3 289
3.6 kg maize daily for first 50 days of lactation	4 375	3 873	3 868	3 359
Response to maize feeding	564	528	480	70
Daily response to each kg maize	3.1	2.9	2.7	0.4

Conclusion

To obtain a high milk yield throughout lactation it is important that both body condition of the cow and her nutrition in early lactation be considered.

A cow calving in good forward body condition and fed adequately to achieve a maximum peak yield soon after calving will be on her way to a high total yield.

Adequate feeding throughout the rest of lactation will capitalize upon the advantage gained in early lactation.



Simmental-Hereford Crossbreeding Studies

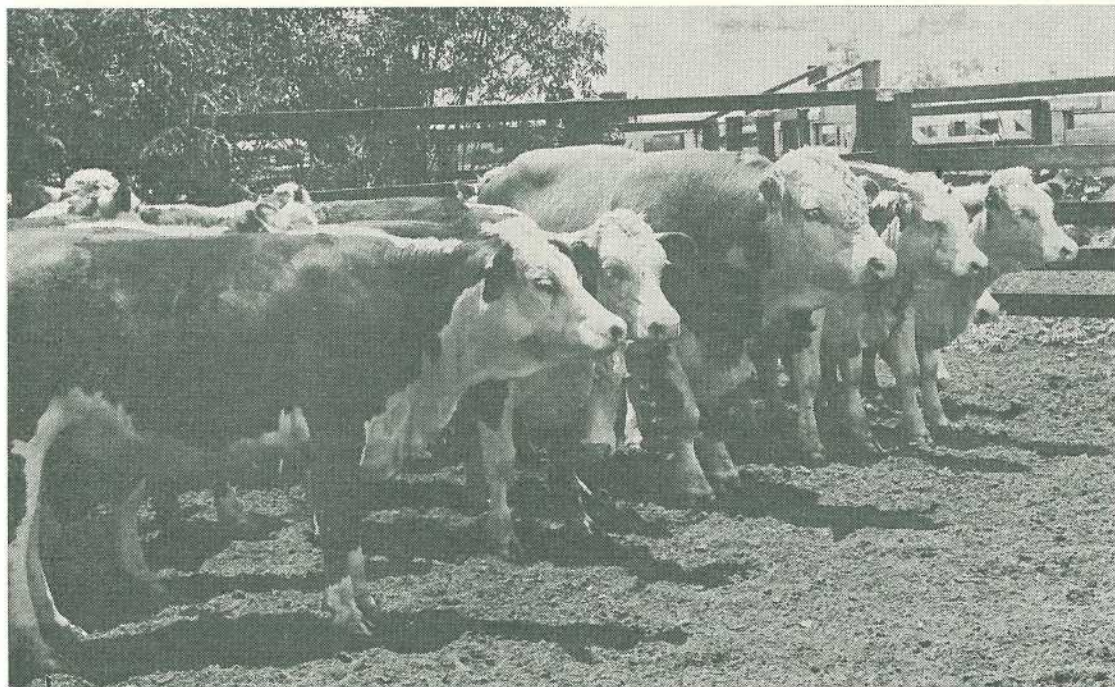
Brigalow Research Station

by P. B. HODGE, Officer in Charge, Brigalow Research Station.

SINCE overseas cattle semen was allowed into Australia after 1969, almost 400 000 doses of Simmental semen entered Australia to the end of 1974. Of these, approximately 40 000 doses came into Queensland.

This new breed is now the largest volume breed imported. Most of the cattle being inseminated with this semen are Herefords, the majority breed in both Queensland and Australia.

The main advantages of the Simmental are a faster progeny growth rate, increased milking ability and the production of a heavier carcass with a minimum of fat.



A group of yearling and 2 year old mated pure-bred heifers with a half-bred Simmental-Hereford sire at end of first mating period in February 1976.

Overseas reports, including those from southern Africa and the Argentine, suggest that the cross between the Simmental and the Hereford incorporates the best traits of both breeds and produces a fertile, faster-growing animal with similar coat colour markings to the pure-bred Hereford.

In October 1972 the Queensland Department of Primary Industries established a large-scale experiment at Brigalow Research Station, Theodore, involving artificial insemination of Herefords with Simmental semen.

In Phase 2 the female half-bred progeny resulting from these earlier artificial insemination programmes have been back-crossed to Hereford sires to produce quarter-bred Simmental calves. In this phase the progeny of this cross will be compared with quarter-bred Simmental calves suckling pure-bred Hereford dams to assess the calf growth boost that can be attributed to increased dam lactation.

It is not intended to increase the Simmental component in the crossbreeding of this experiment above half-bred since it is likely that the Queensland cattle industry will initially have greater interest in less than 50% Simmental cattle, especially in the subtropical areas.

The commercial adoption of Simmental cattle has been necessarily delayed in the industry by the necessity to use artificial insemination to obtain pure-bred Simmental sire access. However there are now a limited number of pure-bred sires available and as their numbers increase, prices of bulls will eventually fall to a commercially acceptable level. When this stage is reached I envisage widespread adoption of crossbreeding between Herefords and Simmentals. Preliminary results indicate that apart from some calving difficulty incidence in maiden Hereford heifers bearing crossbred calves, the Simmental cross cattle are performing very well in the experiment.



A mixed group of pure bred Hereford and Simmental-Hereford cross heifers aged 19 or 31 months in mid-pregnancy.

Sparganosis . . .

a parasitic problem in feral pigs

by

*P. L. APPLETON, Inspector,
Slaughtering and Meat Inspection Branch*

and

*J. H. NORTON, Veterinary Pathologist,
Pathology Branch.*

SPARGANOSIS, a parasitic infection of many feral pigs, is a potential health hazard to those who eat infected pork. Many hunters shoot, slaughter and dress their own feral or wild pigs while other feral pigs are processed in local slaughter houses in Queensland.



Fattened feral pigs awaiting slaughter.

The adult tapeworm *Spirometra erinacei* is found in the small intestine of dogs, foxes, dingoes and cats which eat infected material. Mature segments of the tape worm pass out with the dung. From these segments eggs are released. These develop into free swimming forms. From these a complex life cycle is entered into, involving the steps depicted in the figure on the opposite page.

A deviation of this life cycle can occur when an unsuitable animal e.g. a feral pig, a snake or a lizard eats one of the second intermediate hosts. The plerocercoid is released into the intestine from which it migrates to the connective tissue between the muscles especially of the abdomen and hind legs of the pig.

If man eats infected pork while the parasites are still alive, the plerocercoids will be released into the intestine and then they will migrate to the connective tissues of the muscles, usually of the abdomen.

The feral pig, snake, lizard and man are not essential hosts for the completion of the life cycle of this parasite and are called transport hosts. For example, if a dog, cat, fox or dingo was to eat infected pork, the plerocercoid would be released into the intestine to form an adult parasite and so complete the cycle.

What do Spargana look like?

Spargana are opaque and white in colour, are easily mistaken for nervous or fatty tissue, and are 5 to 8 cm long and about .25 cm wide. They are to be found in the connective tissue of the carcass and are usually curled up although some may lie in an extended ribbon like condition under the peritoneum.

If one of these parasites is found, a diagnosis can be confirmed by carefully cutting out the intact sparganum and placing it in a small amount of water. If it is a live sparganum its body will show signs of movement e.g. contract and expand.

Where are Spargana found in the Pig Carcass?

The majority are to be seen in the connective tissue, under the peritoneum of the abdominal cavity, under the flare fat, between

the abdominal muscles, under the skin of the inner aspect of the hind legs, between the muscles of the hind legs and under the peritoneal lining of the abdominal organs and mesentery. Small numbers may be found in connective tissue in the anterior half of the carcass.

How do Pigs become infected?

When pigs eat infected frogs, toads, snakes, etc. they will become infected with the spargana. These are mainly feral pigs, which have to forage for their food. However, domestic pigs that have access to these infected creatures will become infected.

Can Sparganosis be detected in live Pigs?

Pigs with sparganosis look no different from pigs that are free of this disease. The parasite has no apparent effect on the growth rate or health of the pig. The parasitic worm is found only after the carcass has been gutted.

Typical, white curled up sparganum.

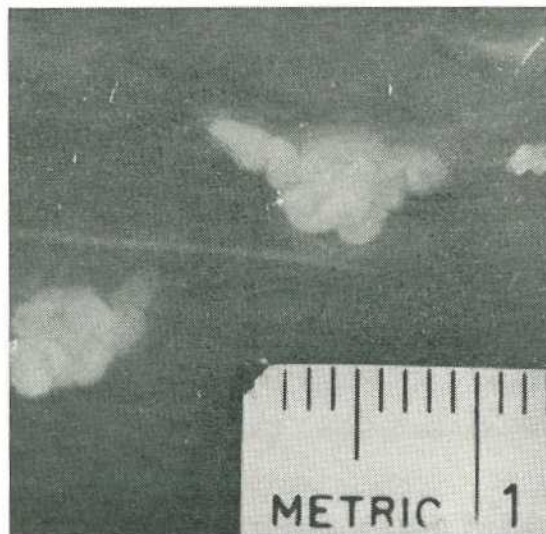
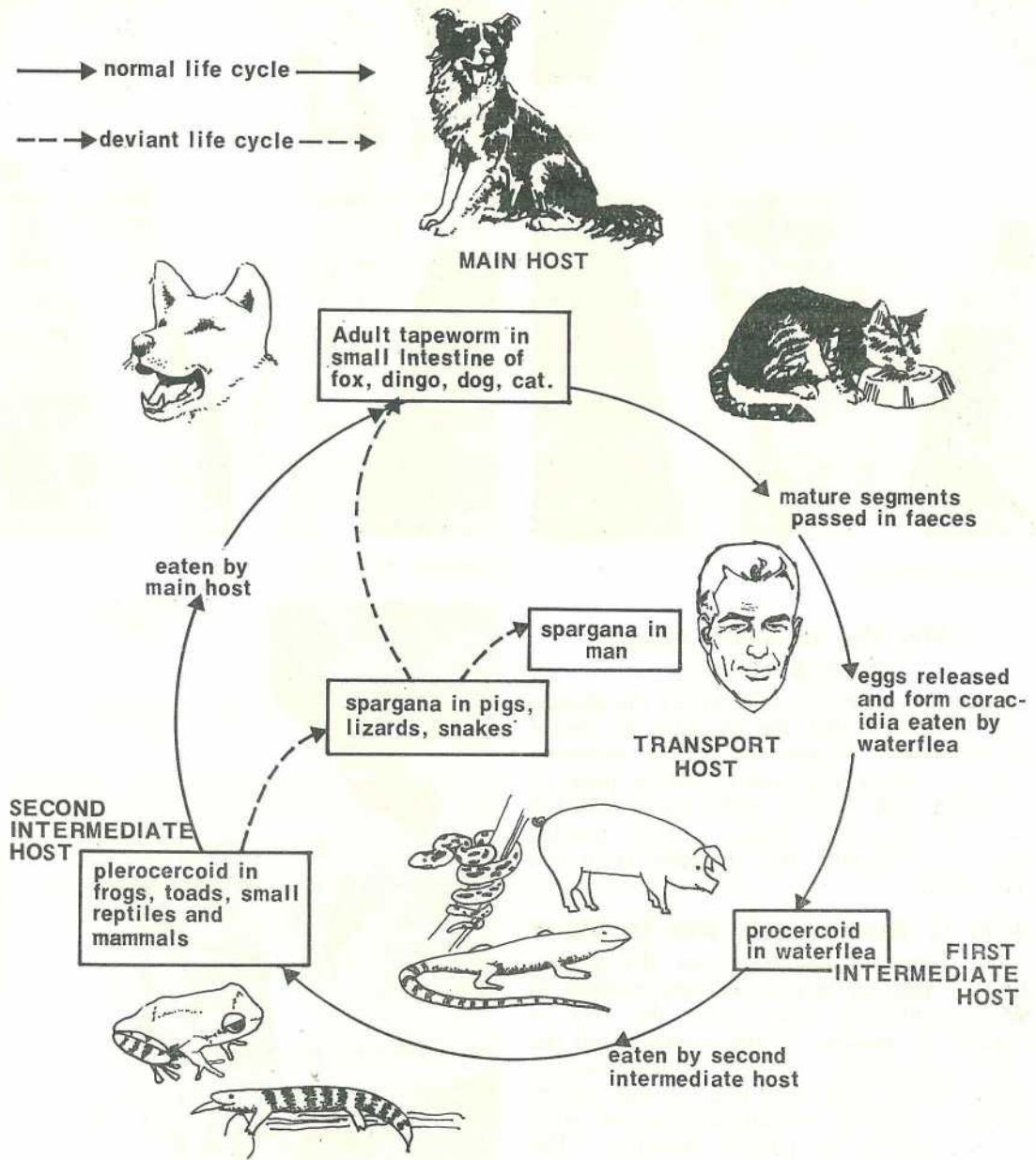
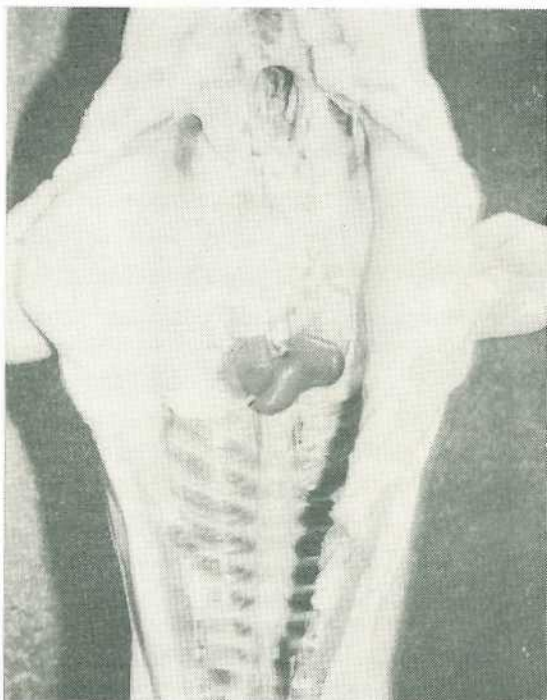


FIGURE NO. 1



LIFE CYCLE OF SPIROMETRA ERINACEI

(The terms coracidia proceroid, plerocercoid refer to developmental stages between eggs and spargana).



Inspection step No. 1.



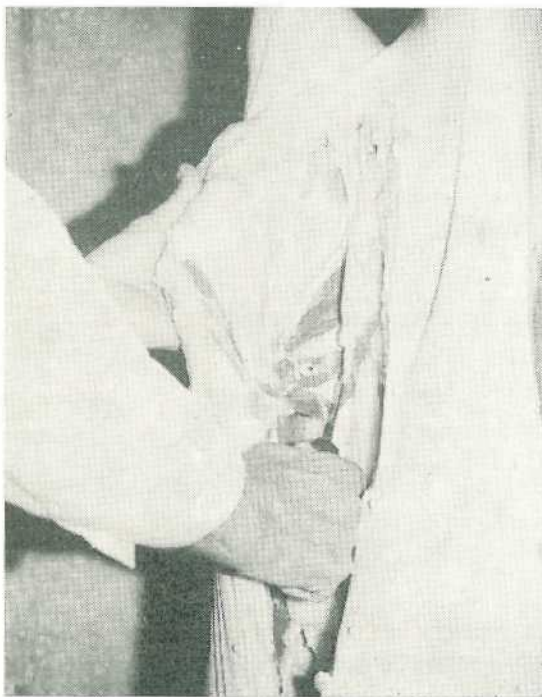
Inspection step No. 2.

Why the concern about Sparganosis?

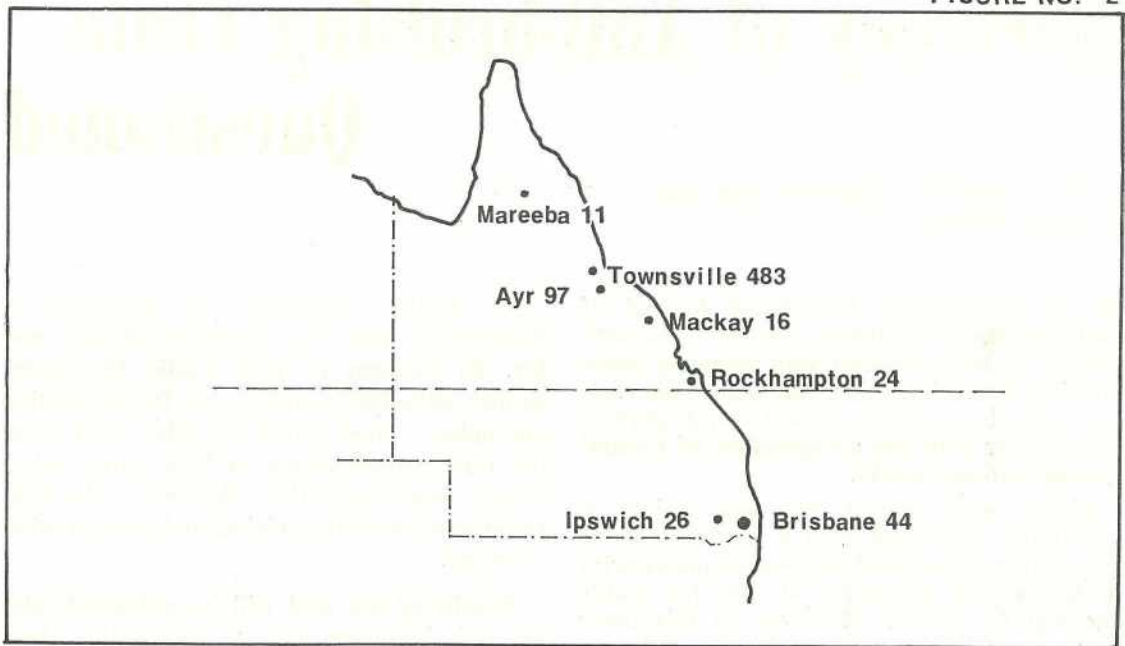
As man can become affected by the disease it is important that the parasite be found and destroyed. People eat the live spargana either by consuming poorly cooked pork or by eating well cooked pork recontaminated after cooking with knives, cutting boards, tongs, etc. carrying the spargana from the fresh pork.

What is Sparganosis like in Man?

The spargana migrate from the gastrointestinal tract of man to become resident in the loose fibrous tissue under the skin or between the muscles of the stomach and the nearby surrounding regions. Patients usually become aware of a small lump in this region, which can vary in size up to 3 cm and often moves about as the parasite migrates. The swelling may be firm or doughy and is often associated with a burning sensation. When the swelling is surgically removed, a small, tapeworm like parasite is found in a small quantity of fluid.



Inspection step No. 3.



Feral Pig Condemnation Rates for Sparganosis at Slaughter (1970-74)

Can Sparganosis be controlled?

Yes, to a limited degree. As sparganosis is a disease hazard to man and as it can only be detected in the slaughtered carcass, all feral pig carcasses should be carefully inspected at slaughter. Those carcasses found to be infected should be destroyed. Infected pig carcasses should not be fed to domestic cats and dogs as they will become infected with the adult tapeworm if this is done.

Control of infection in foxes, dingoes, wild dogs and cats which appear to be the main source of this disease, is not possible at present.

What meat inspection procedure should be adopted?

In North Queensland a technique of inspection has been used that does not disfigure the carcass but which will detect spargana if they are present in the sites the spargana favour.

The inspection procedure consists of three steps:

- Step 1.* The entire inside of the abdominal and pleural cavities are scanned for spargana.
- Step 2.* The flare (i.e. the peritoneal lining together with its associated fat) is removed from the abdominal cavity and reflected up between the hind legs of the carcass. The entire inside of the abdominal cavity together with the underside of the reflected flare is scanned for spargana.
- Step 3.* A cut is made in the thigh region of both sides of the carcass. The surface of the muscles of this region are again scanned for spargana.

These three steps aim to cover those areas where spargana are most commonly found. If one or more spargana are found, the carcass and its viscera are condemned. If no spargana are found, the carcass is passed providing that no other condition warrants a further judgement. The wide distribution of sparganosis in feral pigs can be judged from Figure 2.

Efficiency of Anti-bruising Crate Questioned

by W. R. RAMSAY, Slaughter and Meat
Inspection Branch.

IN the *Queensland Agricultural Journal* of July-August, 1975, lining a stock crate with marine ply was credited with reducing cattle bruising. The evidence for this came from trials conducted by an enthusiastic Central Queensland grazer with the co-operation of Central Queensland meatworks.

Lining with marine ply also enjoys a favourable reputation with a Darling Downs transport company and an Ipswich meatworks, especially for transport of lot fed cattle intended for Japan. However, in this latter case no evidence was available; only an opinion.

Because of the importance of transport factors in the overall picture of bruising it was decided to study marine ply lining further as a topic in the series of studies on bruising being done by Department of Primary Industries, C.S.I.R.O. and Australian Meat Board collaboratively.

At Dalby, Inspector M. Schmidt of Slaughter and Meat Inspection Branch and Mr. R. Gannon of Beef Cattle Husbandry Branch organised a trial to test further marine ply lining. They called on other staff from the three organisations to help carry out a closely supervised trial. Bruises in the trial cattle were carefully weighed and their location recorded.

Details of the trial will be published later but it is important now to record that there was no difference in bruising in the cattle carried in the marine ply lined crate versus the conventional one.

Obviously more trials are needed to resolve this issue and these will be done, but on the evidence available now there must be doubt about the benefit of marine ply lining.

SMALL pesticide containers represent the majority of such containers to be disposed of in Australia, and care should be taken as far as their disposal is concerned.

They should be disposed of either at a public dump or buried at least 18 inches deep at a private disposal site.

First remove the caps or lid, punch holes in metal containers, crush glass containers.

Do not make rafts from them and contaminate waterways, and do not convert them into feed containers.

By courtesy Agricultural and Veterinary Chemicals Association.

BURNING OFF

planning and costs

FIRE has many uses in the normal process of land management and each type of fire is designed for a specific purpose. Unfortunately however many land owners do not adapt their burning practices to suit the type of burn they wish to achieve. It is a case of drop a match and stand back, with the final results being a matter of luck, often lamented and regretted.

Extensive research into the matter has shown that fire behaviour can be accurately assessed and burning techniques can be as precise as any other form of rural science.

PLANNING A BURN

All types of burns require careful planning, fire breaks have to be prepared, equipment checked and man-power requirements assessed. Methods of actual ignition are important but often given little thought. Lighting up techniques are also important but cannot be efficiently achieved if the ignition implement fails to function. A match, a leafy branch, sapwood, a piece of rubber, etc., can always start a fire but will seldom sustain the type of ignition required for a successful operation. A type of Drip Torch or Flame Gun gives controlled ignition as and when required.

The fire should be designed to burn away from neighbouring hazards and the fire break system and access roading should be established accordingly. Man-power and equipment

should be employed and deployed as preplanning and the natural conditions and circumstances require. Each person should know the proposed plan of burning, alterations that will be made to suit changes in climatic conditions occurring during the operation and action to be taken should emergencies happen. Personnel should watch the external area for "spot fires" or "jump covers", the fire inside the breaks is okay, it is the ones outside that cause trouble and damage.

COSTS

The cost of preparing fire breaks and access track and the employment of plant, equipment and man-power varies from locality to locality but can be as high as 10% of the actual clearing costs. It is better to clear 10% less area and have a successful, safe, burn than try to do the job "on the cheap" (and therefore dangerous) and perhaps have to raise additional finance. Tracks should be established when the clearing operations are being carried out so other works can be completed while the timber is drying out.

Areas required for cultivation need more intense fires than areas for improved pastures. A good clean up burn must be executed under the conditions of a high fire danger rating because of high temperatures and low relative humidity with wind velocities not greater than 5-7 miles, 8-10 kms, per hour.

by N. A. SCOTT,
Rural Fires Board.

These conditions occur during the hours of 11 a.m. to 2 p.m. when atmosphere conditions are unstable and fires readily develop an intense convection column which lifts burning embers high into the air where they can be widely distributed by winds above ground level. Fire storms and willy willys also occur under these conditions and can transport embers and burning materials well outside the designed area of the burn.

Safety precautions, man-power and equipment must be planned and utilised to reduce any possible danger from this deliberately planned project.

Fire Wardens and land owners should always be prepared to ensure that conditions of burning contained in the Permit to Light Fire are practical and comprehensive. Burning to clear land for cultivation is the most dangerous form of fire required for land management purposes and such fires must be treated with the respect due to any potentially destructive force occurring under conditions most favourable to its escape from the point of origin.

In all cases of clearing land the lighting up technique is the same. The fire is a continuous line first lit up on the downwind side to burn into the area against wind and when judged to be at least 30 to 60 yds./metres inside the area lighting up is continued on both flanks in continuous lines, finally joining up on the windward side. This ensures that the downwind side and flanks have burnt clear of the edges before the wind driven fire sweeps over the area.

The downwind side and flanks require the greater attention from personnel and equipment should be deployed on these sides.

The upwind side should not be neglected however as willy willys can move against the wind and the higher level winds may transport embers lifted by the convection current at an angle to the direction of the low level wind.

It must always be remembered that the conditions suitable for a good burn mean that adjoining areas are also highly flammable. A breakaway fire, jump cover or spot fire will develop quickly under such conditions. *Don't let them get away.*

BURNING PULLED AND CLEARED LAND

Small areas to 300 acres/120 ha

The shape of small areas to approximately 300 acres/120 ha, will dictate the lighting up technique used. In the case of long narrow areas the slower but safer methods of burning the whole area out against the wind is quite effective. The operations must be prepared for wind changes and act accordingly should the wind swing to a different direction.

For regular shaped areas the lighting up technique is the same as for areas up to approximately 1 000 acres/400 ha, a burn of this size takes at least two hours, 30 to 45 minutes being spent lighting up the edges.

Medium sized areas to 600 acres/240 ha

Areas up to 600 acres/240 ha can be lit up from the edges as previously described and successful trouble free burns are obtained if the preparations have been properly carried out and vigilance maintained.

Areas larger than 600 acres/240 ha

Larger areas need different lighting up techniques as air movement from within the unburnt area contained by the ring of fire can cause trouble by forcing the fire outwards.

The fires lit continuously around the perimeter develop into a number of convection currents. Air movement occurs not only from outside the designed area but also from within it. A column of cold air drops down inside the area and spreads sideways in all directions on its passage to replace the air which is heated by the fire and rising in the convection currents.

In order to counteract this wind force easy access should be available to the centre of the area. It is desirable to have at least two such tracks, just in case.

Lighting up starts on the downwind side of the area and a continuous line of fire is established towards both flanks and allowed to burn back against the wind until a suitable firebreak is established. Lighting up in a continuous line is then carried out up both flanks until about level with the centre of the area.

Someone now has to enter the area (no less than two for safety) and begin lighting up in the centre of area. In this instance a number

of separate spot fires are lit so an intense fire cannot develop. Once these spot fires are lit the personnel retire to safety and lighting is continued in a continuous line along the flanks and across the windward side.

The fires lit in the centre will join and move with the wind creating a convection current.

Air movement will then be from outside the designed area so the fire will tend to move inwards from all sides.

In a large area with heavy fuels the fire storms that occur are very impressive but personnel must not relax their vigilance as embers and burning materials can be distributed over a wide area in any or all directions.

Pastures—Native Grasses

Areas needed for native pastures do not need an intense burn otherwise the grasses will be burnt out and reseeded will be required.

The soil should be moist.

The fire will clean up suckers, small branches, leaves and twigs but leave most of the larger stems, roots, etc. Once the grass is well established routine burning to clean up unpalatable dry grass will eventually clean up the larger timber.

Lighting up technique is the same as before.

Improved Pastures

Areas to be converted to improved pastures require a fire of sufficient intensity to clean up all native grasses, suckers, regrowth, leaves, twigs and timbers up to 6 inch/15 cm in diameter. Many of the large stems will also burn but a good percentage will remain.

The soil should be dry but there should be reasonable expectations of rain, generally from storms.

The ashes make a good seed bed unless the depth is too great. Stems left help to prevent soil erosion and make good protective seed beds.

The lighting up technique is the same as before.

Burns for pastures can be executed as early as August. If carried out in November to January night burning will give the milder conditions required for this type of burn.

Burning unpalatable grass

The object of this type of burn is to clean out the dry grass so that stock has ready access to the new growth. The burn may also be used to destroy suckers and regrowth.

Intense fires destroy grasses, particularly during dry periods when the roots will smoulder leaving filaments of pure carbon in the soil to a depth of several feet. Grass seeds in the humus are also destroyed. The soil is left bare and will be subjected to water and wind erosion. Undesirable species will take over and the paddocks will be useless until reburnt and reseeded.

Burning off should be carried out under mild conditions when the soil contains moisture.

In this type of fire the lighting up technique is different to that used for scrub burns although the pattern of lighting up is the same.

When fires are lit on a continuous face, as for scrub burns, the fire develops an original intensity about ten times greater than when spot fires are lit about five feet apart along the face. Once the fires join up the intensities are the same in both instances.

In order to prevent intense fires from developing spot fires are lit at wide intervals along the downwind side and allowed to burn into the area and merge to form a suitable burnt out width for a fire break.

Lighting up is continued as well spaced spot fires along both flanks with wider spaced spot fires along the windward side.

Under mild conditions the fires will spread slowly and relatively few areas will be subjected to a high intensity fire as the fires join up.

Fire hazards

Abating fire hazards by reducing the continuity and quantity of fuel is the best and least expensive method of improving fire safety on a property. This can often be carried out in conjunction with burns to remove unpalatable grass and getting rid of suckers and regrowth.

Prescribed control burning operations are carried out late in the winter and early in spring when climatic conditions are mild even during the noon period. These burns are not intended to cover the whole of an area but the

pattern of burnt and unburnt country prevents a high intensity fire from developing under late summer conditions.

The Forestry Department in Queensland uses aircraft to enable large areas to be treated in a day. The Department treats hardwood and cypress pine areas but the method could be adopted for grass land if a number of land-owners co-operated with each other.

In this type of burn the technique of lighting up is by regular spaced lines of spaced spot fires. These fires are commenced about midday so the fires will not be likely to join up before late in the afternoon, if at all. The lighting up starts on the downwind side and continued in lines across the wind, back and forth until the area is covered. When lighting by hand the spots are spaced so steep hillsides and areas of heavy fuel will not burn until late in the day thus avoiding areas of intense fires. Due to practical difficulties of lighting by hand many areas will be missed during the first operations but these can be picked up at a later date if an inspection shows a second burn is desirable.

Burning Fire Breaks

Fire breaks appear to be easy to burn off as they are generally fairly narrow, from 20 to 100 metres wide, and the fire does not have sufficient distance or area to develop into an intense burn.

In actual practice it will be found that burning firebreaks is quite an exacting occupation requiring ample manpower and equipment. Burning a break should never be conducted by a "so many miles per day" method, the rate of burning should be established by the circumstances of the burn, patrols back along the both sides of the break are essential.

The lighting of technique is to light up in a continuous face along the downwind side before commencing on the windward side and to ensure that the downwind side is always in an advanced position. By maintaining this relationship it is easy to light across the width of the break at a suitable spot and light up backwards thus stopping operations for the occasion and at the end of the day.

Personnel on patrol along the length of the break should be equipped to handle smouldering fuels close to the edge, trees on fire, "spot fires" or "jump overs". The forward line of the fire should never be neglected.

Mopping up operations are essential if the fire break is not to become a source of wild fire after the personnel have left the scene.

Miscellaneous fires

Cleared forest land is often "windrowed", the lines of stacks running the length or width of the area some 20 to 60 metres apart.

Large stacks of timber need many hours of burning to reduce all the timber to ashes.

Care must be exercised when a stack is first lit as the convection current will lift burning light fuels high into the air. These can float a considerable distance and cause spot fires. As the fire develops in large stacks the moisture contained in large pieces of timber can be converted to super heated steam. It is not unusual for such timbers to explode showering embers and burning timbers over a wide area.

Once stacks are ignited they should not be left unattended and vigilance must be maintained until all coals and embers are blacked out.

Remember that grass and other green fuels quickly dehydrate when close to fires and will readily burn, ensure that the area has well cleared fire breaks. The fact that the timber is stacked doesn't mean that the fire cannot escape.

Every fire has the potential to start a holocaust, a camp fire or billy fire, burning off household litter, garden rubbish, orchard prunings, each must be treated seriously and should always be lit in a well cleared area removed from any large pieces of fuel, tree stump or dead trees, etc. Such fires should never be left unattended while burning and should be cold before being completely deserted.

Permits to light fires are obtainable from either a local Fire Warden or the Chief Fire Warden. It is an offence under the Rural Fires Act to use fire without first obtaining a permit.

Thrips

(Order Thysanoptera)

by I. D. GALLOWAY, Entomology Branch.

MOST growers have, at some time, become acquainted with the damage that can be inflicted by thrips. However, despite evidence of their presence, individually most thrips are so small they often escape notice.

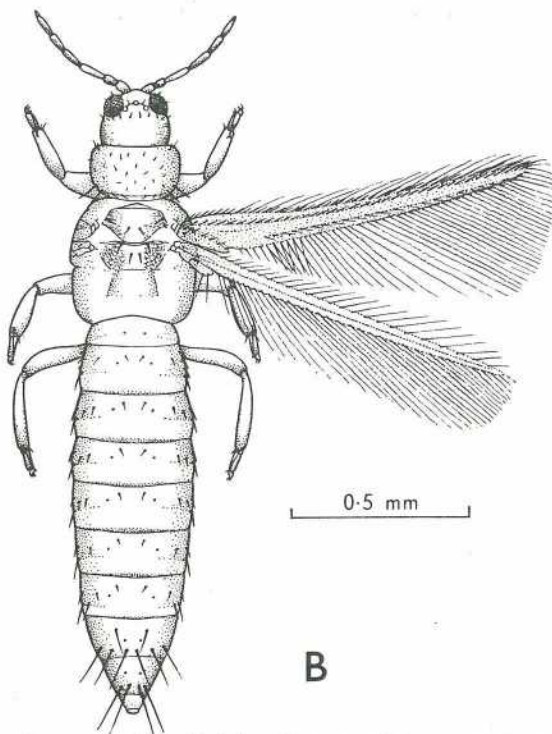
These diminutive soft-bodied insects can range in length from 0.5 mm to 12 mm. They have two pairs of delicately fringed wings. It is from these wings that the order derives its name, Thysanoptera, from the greek *thusanos* a fringe and *pteron* a wing. The term bladder-foot is sometimes used in reference to thrips because of the protrusible bladders found at the base of the feet and operated by muscular contractions and blood pressure. Thrips use their bladder feet to adhere to a variety of different surfaces.

In Australia, the many different species of thrips can be divided into two large groups, the suborder Terebrantia and the suborder Tubulifera.

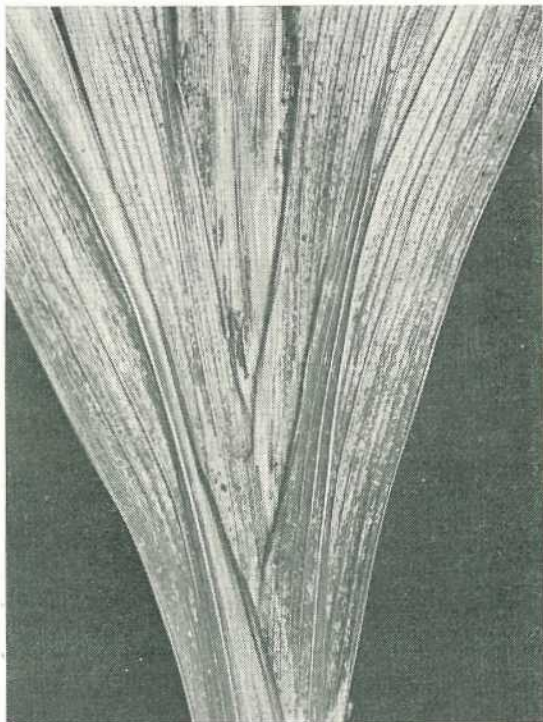
Suborder Terebrantia

This suborder may be distinguished from the Tubulifera by the following features:—

- the fringed wings lie parallel to one another when at rest,
- the females possess a sawlike ovipositor,
- the last segment of the male abdomen is conical in shape.



A narrow-winged thrips (*Isoneurothrips australis* ♀).
(Illustration reproduced with the kind permission of CSIRO, Division of Entomology and Melbourne University Press).



Silvering of the leaf surface of a gladiolus caused by *gladiolus thrips*.

Most thrips belonging to this suborder suck juices from leaves, flowers, fruits and young shoots, while many of the flower dwelling species swallow pollen grains or suck their contents. Thrips are well equipped for these feeding habits and possess mouthparts which have been adapted for piercing, scraping and sucking.

The female deposits her bean-shaped eggs in slits cut in the plant tissue with a saw-like ovipositor. Though most thrips lay fertilized eggs, in some species the female is capable of producing normal offspring without first mating with a male. This process is known as parthenogenesis and results in the production of either males or females only.

Depending on the prevailing temperatures the eggs hatch in 2 to 20 days and pale wingless miniatures of the adult emerge. These nymphs are retiring individuals which quickly seek refuge in the depths of the flowers or bud scales and commence feeding. Growth then occurs through a series of moults.

With the second moult a pair of wing buds are developed and the young thrip moves to the soil beneath the host plant. This stage of development is known as the pre-pupa. Pupa-tion takes place either in the surrounding vegetable rubbish or in small earthen cells located several inches below the surface of the soil. With the final moult the fully winged adult thrip emerges from the pupa.

Within the Terebrantia two further sub-groups of thrips can be recognized; those possessing narrow wings which are usually pointed at the apex, and those with broad wings which are rounded at the apex.

Narrow-Winged Thrips

Thrips with narrow wings make up the largest group in the Terebrantia and contain many species of economic importance.

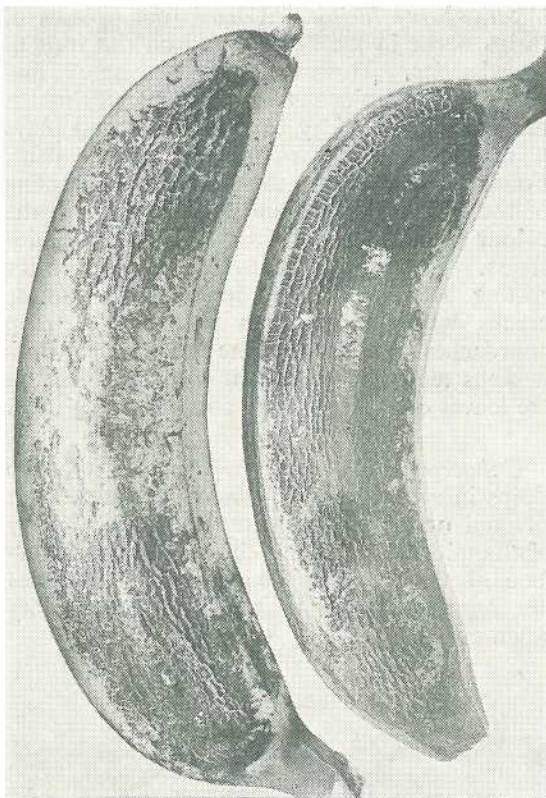


Gladiolus thrips damage to blooms.

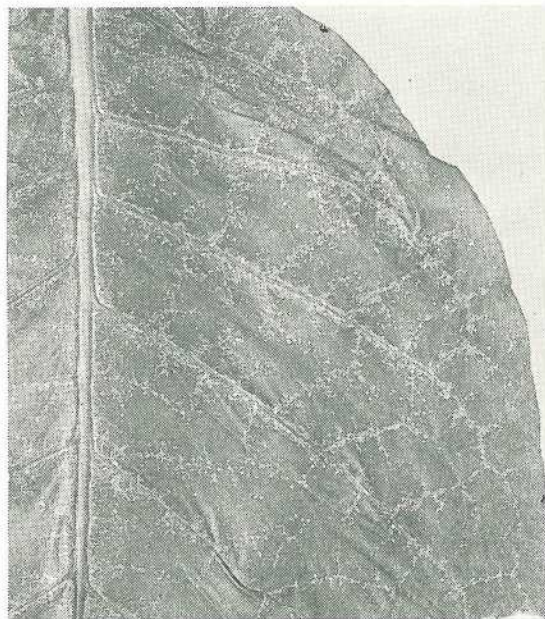
Onion thrips or cotton seedling thrips—These thrips are widespread through Queensland and have been responsible for considerable damage to cotton, onion, and cucurbit crops.

In cotton crops the leaves and stems of seedlings are attacked with the result that infested portions of the plants suffer distortion. Laceration of the host-plant surface also takes place producing small white blotches or streaks. The cumulative effect of these lacerations is a silvery white appearance on the undersurface of the foliage. Destruction of the terminal bud and a bronzing of the cotton bolls where the bracts are in contact with the rind may also indicate cotton seedling thrip damage.

The silvery white appearance of foliage is also evident in onion and cucurbit crops under attack. Heavy infestations in an onion crop will adversely effect the size and quality of the bulbs produced while in cucurbit crops, particularly cucumbers, severe attacks may be fatal to seedlings and young plants.



Banana rust thrips damage.



Damage to a tobacco leaf caused by tobacco thrips.

Gladiolus thrips—Gladiolus thrips are frequently a pest in southern Queensland and in some gardens and nurseries the crop of blooms may be seriously affected by their presence. The dark brown adults and small yellowish nymphs of the gladiolus thrips are usually to be found in the more sheltered parts of the flower spike or growing point. Typically gladiolus thrips cause an uneven silverying on the surface of the leaves and malformation in, and discoloration of, the flower spike.

Bean blossom thrips—Bean blossom thrips infestation in French beans is manifested by a curling of the pods which follows attack within the flowers when pod formation is in progress. Russeting may also be caused by larval colonies feeding on pods approaching maturity. If the growing point of a young plant is attacked before the flowering stage a gross distortion of the plant may result.

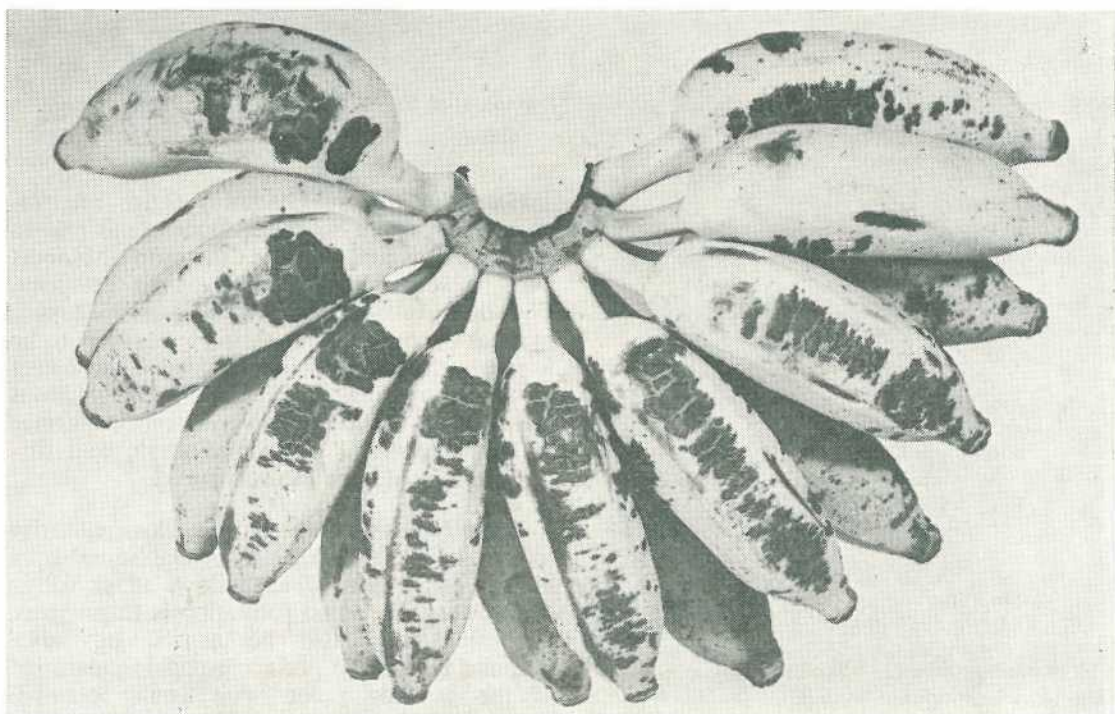
Strawberry thrips—At least four species of thrips occur in the flowers and on the fruit of strawberries. However, only the small and almost inconspicuous strawberry thrips is responsible for injury to the foliage and plays a major role in the damage to the fruit. Foliage damage takes the form of a crimpling of the younger leaves and an alteration in the colour from the usual glossy green to a bluish shade. Fruit injury is evidenced by surface rusting accompanied by innumerable minute cracks which increase in size as the crop approaches maturity. The tiny pale white nymphs tend to associate in colonies either on the leaves or in the flowers and the young fruit.

Tobacco thrips—The presence of tobacco thrips in a tobacco crop may be revealed by a silvered or frosted appearance in the vicinity of the midrib and main veins of the upper surface of the leaves. Heavily attacked leaves are reported to be of unsatisfactory quality when cured.

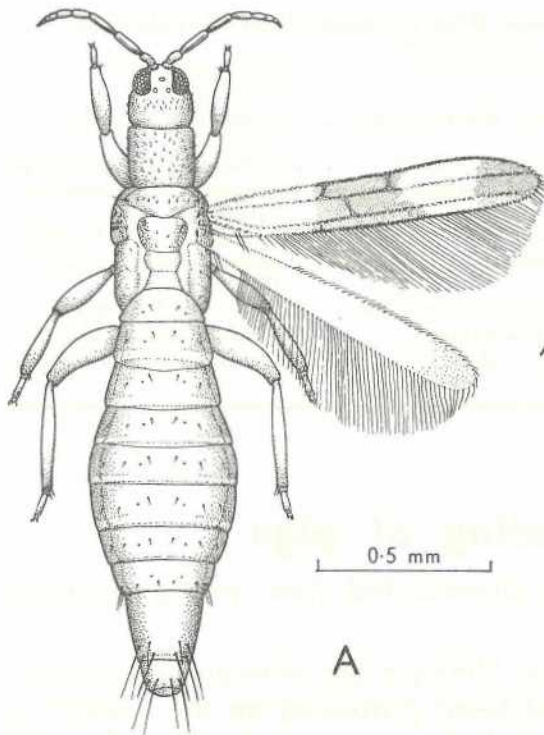
Tomato thrips—Faulty fruit setting and fruit malformation in tomatoes may be due to a number of factors but in North Queensland high thrip populations are a probable cause particularly in dry weather. The small cream coloured tomato thrips can usually be located clustering inside the flowers.

Banana rust thrips—In a banana crop the presence of banana rust thrips may be initially detected by a smokiness between the fruits. This develops later into a red rust accompanied by surface cracking.

Banana flower thrips—Economic damage by the banana flower thrips is usually confined to Cavendish varieties though Ladyfinger bananas are also occasionally attacked. Injury is usually restricted to the flower parts at the tip of the fingers, the basal parts of the fingers and the adjacent areas of the cushion. In very hot periods adults also damage the ultimate outer curve of the fruit causing a blemish known as corky scab.



Corky scab of Ladyfinger bananas caused by banana flower thrips.



A broad-winged thrips (*Desmothrips propinquus* ♀).
(Illustration reproduced with the kind permission of CSIRO,
Division of Entomology and Melbourne University Press).

Broad-winged thrips

Species of thrips with broadwings have been recorded on a variety of grasses and blossoms in Queensland but they are considered to have little economic importance.

Suborder Tubulifera

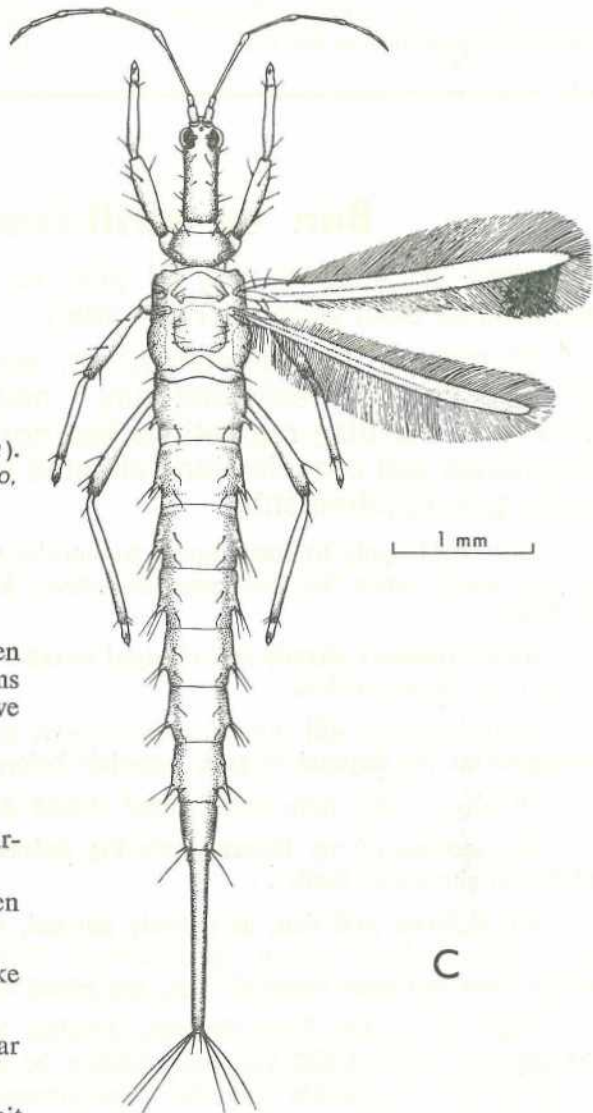
Thrips belonging to this suborder are characterised by the following features:—

- the fringed wings overlap one another when at rest,
- the females do not possess a saw-like ovipositor,
- the last segment of the abdomen is tubular in shape in both sexes.

Species belonging to this suborder exploit a wide variety of habitats. Many feed on fungi growing on dead trees, or in leaf litter,

while others have acquired the habit of forming galls on the stems and leaves of some of our native trees.

Also included in the Tubulifera is the giant thrips which is considered to be one of the largest thrips in the world. This remarkable creature measures some 12 mm in length and can usually be found on fallen eucalypt branches.



Giant thrips (*Idolothrips spectrum* ♂).
(Illustration reproduced with the kind permission of CSIRO,
Division of Entomology and Melbourne University Press).

One of the economically important species belonging to this suborder is the black plague thrips. This species sometimes appears in large numbers on grapevines when they are in flower. Feeding occurs in the flowers and on the undersurface of the leaves, with a heavy infestation resulting in considerable flower drop and faulty fruit setting.

Following are the scientific names of insects mentioned in this article. They are listed in order of appearance in the text.

Onion thrips or cotton seedling thrips	<i>Thrips tabaci</i> Lindeman
Gladiolus thrips	.. <i>Taeniothrips simplex</i> (Morison)
Bean blossom thrips	.. <i>Taeniothrips nigricornis</i> Schmutz
Strawberry thrips	.. <i>Neophysopus fragariae</i> Girault
Tobacco thrips	.. <i>Hemianaphothrips concinnus</i> Morison
Tomato thrips	.. <i>Frankliniella schultzei</i> Trybom
Banana rust thrips	.. <i>Chaetanaphothrips signipennis</i> (Bagnall)
Banana flower thrips	.. <i>Thrips florum</i> Schmutz
Giant thrips	.. <i>Idolothrips spectrum</i> Haliday
Black plague thrips	.. <i>Haplothrips froggatti</i> Hood

Ban on swill-feeding of pigs

THE ban on swill-feeding of pigs in Queensland now would become effective as from October 1 this year.

In making this announcement, the Minister for Primary Industries, Mr. V. B. Sullivan, said that July 1 had been proposed as the operative date, but amending regulations had not been promulgated in time to give individuals and organisations affected by the ban sufficient time to adjust to the new requirements.

This could apply to some Local Authorities whose responsibility it would be to dispose of food wastes when the ban came into effect. Some already had taken the necessary steps to do so.

Some producers already had changed to other feeds and, therefore, would not be required to take any further action.

"Establishments still supplying food wastes to swill feeders now should make alternative arrangements for disposal of such materials before October 1", Mr. Sullivan said.

"Producers who have not changed should do so on, or before that date.

The services of my Department's Pig Branch are available to those producers seeking advice on alternative foods".

Mr. Sullivan said that, as recently advised, the ban would not apply to the feeding of waste dairy products, fruit or vegetable wastes, bread and biscuit wastes from bakeries, or fish wastes, provided these materials were not mixed with other substances of animal origin.

Offal and residues from abattoirs, slaughter houses and butchers' shops may, subject to the approval of the Chief Veterinary Officer, be boiled and fed to pigs on licensed slaughter house premises, or on other premises of an approved standard licensed under the provisions of the new regulations.

Tomato Diseases

Compiled by J. E. C. ABERDEEN, Plant Pathology Branch.

TOMATO plants are highly susceptible to diseases at any stage of growth. Many of these diseases can cause substantial loss. Successful tomato growing depends on the use of healthy seed, the production of healthy seedlings and their establishment in well managed soils. Thereafter a continuous programme of plant protection is necessary to control diseases and pests.

The above series of activities must *all* be emphasised. Decisions on some, such as spraying of the foliage, can be delayed until the crop is growing, but for others, the vital decisions must be made much earlier, e.g., the choice of a suitable cultivar and the situation of seedbeds.

An extra emphasis is placed on these latter measures because the decisions must be made *before* there is any apparent need. When the disease appears it is too late. These points are listed in the control notes for each disease, and further re-emphasised under "General control measures" because they are usually important for several diseases. They are preventive and are needed to reduce the number of

disease-causing agents to a minimum before the crop is planted in the field.

Because the methods of control of the individual diseases vary, it is important for the grower to be able to recognise those diseases which are most likely to occur in his area. It is also important to know how the disease gets into the crop in the first place and how it subsequently spreads within the crop. These data influence the method of control. The grower should familiarise himself with the photos and the notes applicable to each disease.

The notes on control for each disease are grouped in a logical time sequence. The groupings are (i) preplanting precautions; (ii) treatment of seed and seedbed; (iii) treatment of growing crop; and (iv) harvest and post harvest treatments. These actual headings are not inserted in the sections on control but the data are listed in this order. Every grouping is not applicable to every disease.

New fungicides and cultivars are regularly introduced into the industry. Consequently some of the control recommendations will change relatively frequently. Currently recommended fungicides and cultivars are listed at the end of this leaflet. We propose to revise this list whenever necessary and publish it separately.

Target Spot

Importance

Target spot is a potential cause of major loss in all the tomato-growing areas of Queensland. It may affect seedlings, mature plants and fruits.

Symptoms

On the leaves it produces dark-brown zonate spots, commonly 3 to 6 mm in diameter but up to 12 mm under favourable conditions, with definite margins and yellow edge. Spots on the stems are more elongated. On the seedling a large dry dark shrunken area may occur on the stem at soil level or higher up. This stunts the plant and may cause it to snap off readily. On the fruit there are black to dark-brown, oval to round spots, which occur commonly on the edge of the stem scar or on a growth-crack. These spots develop more rapidly as the fruit ripens.

Cause and source of infection

It is caused by a fungus (*Alternaria solani*) which produces spores on the diseased parts of the plant and these are blown about by the wind. The first infections can occur in the seedbed or in the field. They may result from spores blown from other diseased plants (either cultivated crops or volunteer plants on headlands and other places), from spores splashed up from undecomposed tomato debris in the soil or from infected seed.

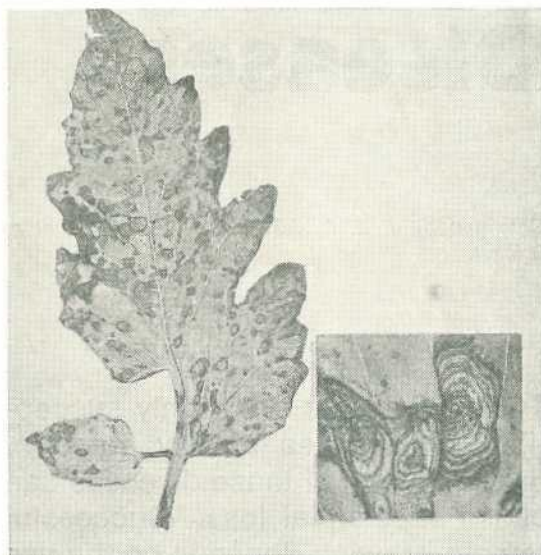
Conditions favouring the disease

Once established it spreads from plant to plant by wind, rain splash and overhead irrigation. The target spot fungus is favoured by warm temperatures, so that the autumn and spring seasons are most likely to provide conditions favourable to epidemics. Nevertheless, the disease is present to some extent throughout the year and may still spread significantly in relatively dry weather. The disease advances more rapidly when the plant is carrying the maximum load of fruit, or if plants are backward.

Control

The destruction of old tomato crops before planting the seed is strongly recommended and there should be a rotation of at least twelve

months between tomato crops on the same piece of ground. (See section on CURRENT RECOMMENDATIONS).



Target spot on foliage. Inset shows concentric rings more highly magnified.



Target spot on fruit.

Use only those cultivars which are resistant unless there is definite reason otherwise. Every precaution should be taken to use disease-free seed and seedbeds and the seedbeds must be sprayed every 7–10 days. (See section on CURRENT RECOMMENDATIONS).

A thorough cover of the foliage of the growing crop with a suitable fungicide is essential. This must be applied at 7–10 day intervals, depending on wet or dry conditions respectively. (See section on CURRENT RECOMMENDATIONS).

Grey Leaf Spot

Importance

The disease is present in all tomato growing areas but is becoming less important as resistant varieties are used more widely.

Symptoms

Only the leaves are affected. The spots are relatively small, 1–3 mm across, and variable in outline. They are dark-brown or grey, becoming lighter in the centre with age and there is a narrow pale yellow halo around each spot. Yellowing of the entire leaf is characteristic of severely affected leaves. Absence of spots on stems, leaf stalks and fruit helps to differentiate it from bacterial spot and speck.

The cause and source of infection

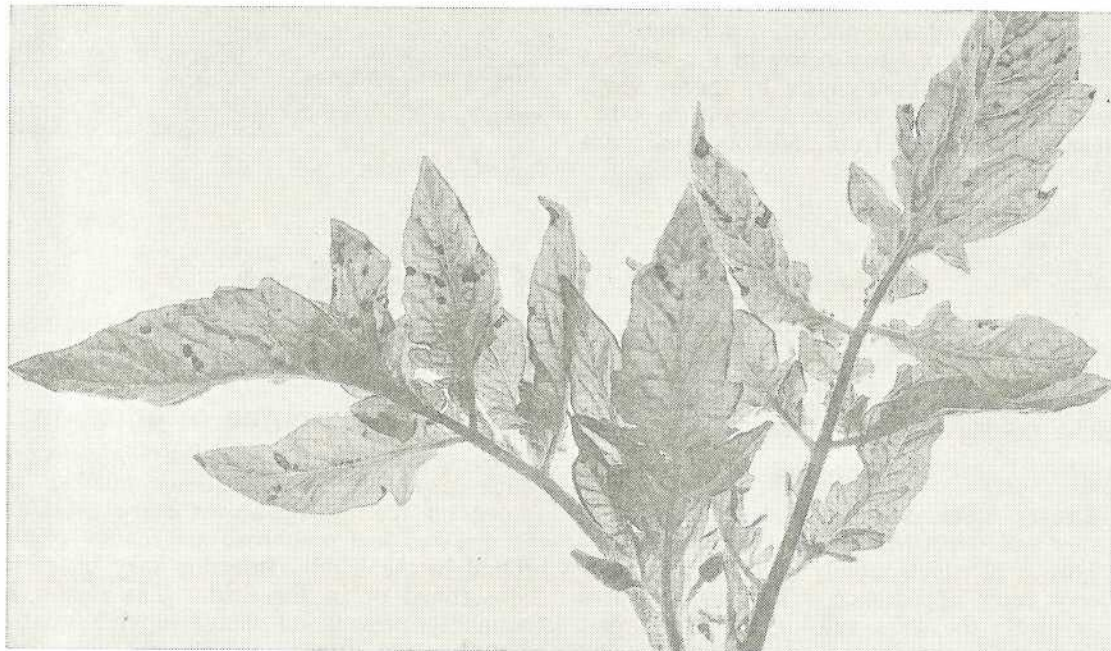
It is caused by a fungus (*Stemphylium solani*). Spores are formed on the older spots and senescent leaves and these are blown in the wind. Undecomposed tomato debris and other diseased tomato plants are the chief sources of infection. (See section on TARGET SPOT).

Conditions favouring the disease

Prolonged wet weather in the cooler seasons and early spring are the main factors.

Control

As for target spot.



Grey leaf spot.

Septoria Leaf Spot

Importance

Septoria leaf spot occurs in all of Queensland's tomato-growing areas, but seldom causes significant losses.

Symptoms

The disease is characterised by small brown spots 3-4 mm in diameter which appear first on the lower leaves. The margin of the spot is brown while the centre is a light-grey colour and characteristically studded with small, black, pin-point sized dots. The spots are usually much smaller than those of target spot, but the early stages could be confused with bacterial spot. The leaf tissue around the spots turns yellow and the whole leaf gradually withers.

Cause and source of infection

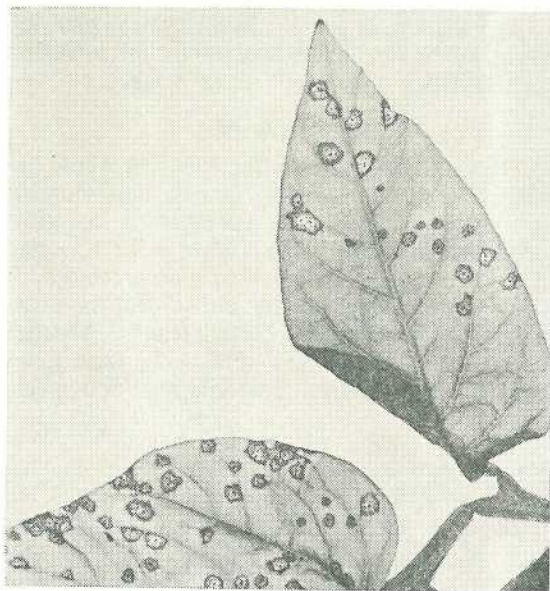
The cause is a fungus (*Septoria lycopersici*). The pin-point dots mentioned above are the openings of minute flash-like structures from which spores are released for distribution by wind, rain and overhead irrigation. The first infections can occur in the seedbed or in the field and are caused by spores which are blown in from diseased plants in other areas or splashed up from undecomposed plant debris in the soil.

Conditions favouring spread

The disease is most serious in the warmer months of the year and requires either showery weather or heavy dews to spread within the crop.

Control

Treatments used for target spot are usually sufficient to control this disease.



Septoria leaf spot.

Grey Mould and Ghost Spot

Importance

This disease is of minor importance to the industry as a whole but relatively more important in the higher rainfall areas.

Symptoms

Leaves, stems and fruits are affected. On leaves and stems there is first a water-soaked greyish area which rapidly takes on a greyish-brown furry appearance. The affected area may girdle the stem causing the upper part to wilt. On the fruits a pale ring-like spot is characteristic (ghost spot). Following

injury infected fruit may also develop the greyish-brown furry appearance.

Cause and source of infection

The cause is a fungus (*Botrytis cinerea*) which produces a tremendous number of spores on the greyish-brown furry areas of the diseased leaf and these are readily blown around in the wind. Infection may occur in the seedbed or in the field. The fungus is commonly present on damp organic matter as well as on diseased plants and undecomposed tomato debris in the soil.

Conditions favouring the disease

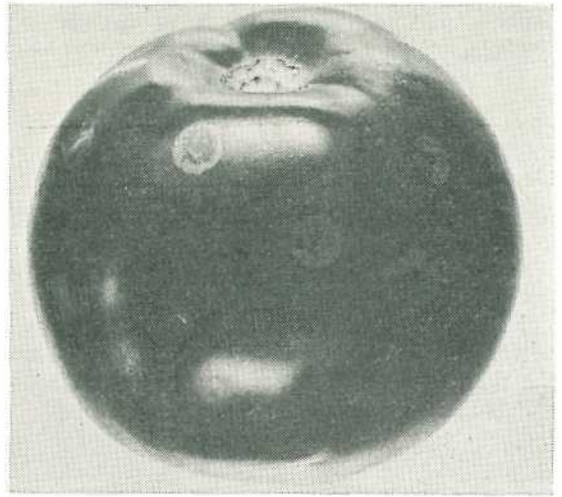
The most important factors are abundant moisture, relatively low temperatures and some form of injury e.g. rubbing and pruning cuts on the stem, or rubbing and other forms of injury on the fruit.

Control

The most important control measure is to spray the growing crop at regular intervals. (See section on CURRENT RECOMMENDATIONS). The commencement of spraying may be delayed until the first symptoms appear on the stems or leaves or the occurrence of weather favourable to the disease.



Grey mould on stem.



Ghost spot.

Phoma Rot

Importance

Generally this disease is of minor importance, but it can be a major cause of fruit loss in high rainfall seasons.

Symptoms

On the fruit it forms sunken spots not unlike those of target spot. These spots occur on cracks and any other damaged area on the fruit surface. A close examination of the larger spots reveals a pimpled appearance

in the centre of the diseased area which is characteristic of this disease. The diseased tissue remains quite firm unless invaded by soft rot organisms, and the spots may later darken. Leaves and stems may show large dark spots with concentric rings.

Cause and source of infection

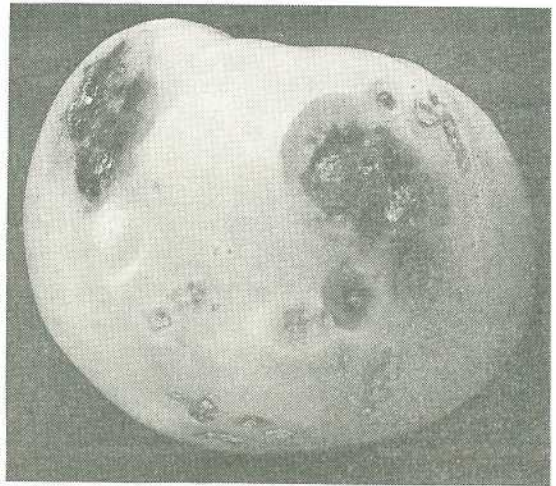
The causal agent is a fungus (*Phoma destructiva*) which is a wound parasite only. Residues of previous tomato crops are the main source of infection.

Conditions favouring the disease

The most important single factor is excessive moisture both in the field and on the harvested fruit. Rain splash, wind, insects and handling of wet bushes readily spread the spores. It develops more rapidly on the ripe fruit.

Control

The recommendations given for target spot are equally applicable here. If the disease is present then it is likely to cause post harvest fruit damage. Every precaution should be taken to reduce injury during harvesting and packing and to dry the fruit as rapidly as possible.



Phoma rot

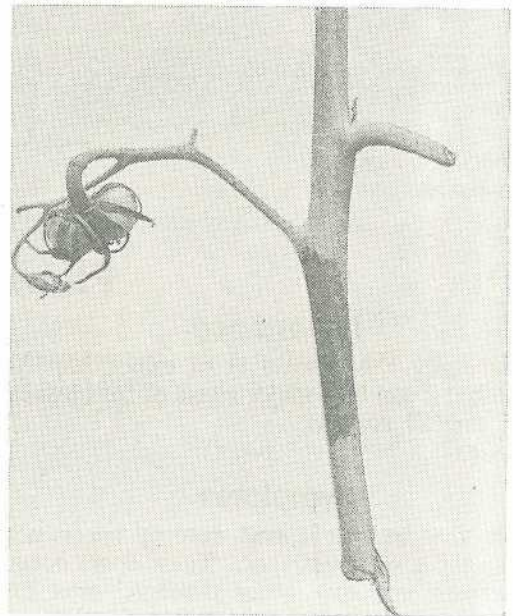
Irish Blight

Importance

Irish blight is not now an important disease of tomatoes in Queensland. Nevertheless given the right conditions, it could still be disastrous for an inexperienced grower.

Symptoms

The first symptoms of this disease are extensive dark-brown to black areas on the stems and leaves. In moist weather the affected leaf may rot and show a white downy growth on the lower surface, but with dry conditions the affected areas are dry and papery. A large mottled-brown area with indefinite margins may occur on fruit at any stage of maturity.



Irish blight on stem.

The cause and sources of infection

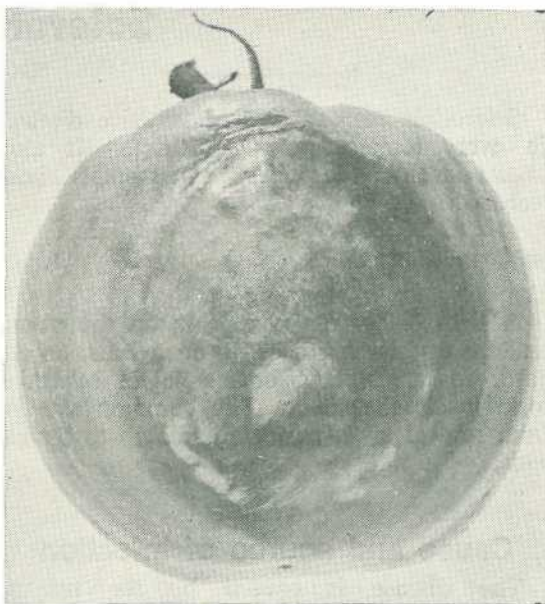
The disease is caused by a fungus (*Phytophthora infestans*). The diseased parts of the plant produce large numbers of spores in a very short period when the weather is suitable. These spores are blown about by the wind.

Conditions favouring the disease

Since the spores are very sensitive to dry conditions, the disease will become serious only if favourable conditions, i.e., cool and wet weather, occur a number of times within the life of the crop. In Queensland, suitable temperatures can occur only in the winter and early spring. As Queensland winters are normally dry, epidemics of Irish blight are rare.

Control

The most important method of control is to spray the growing plants with a fungicide. In a cool wet season it needs to be done weekly. (See section on CURRENT RECOMMENDATIONS).



Irish blight on fruit.

Leaf Mould

Importance

This disease is of major importance in the high rainfall districts but is rare in the Brisbane area.

Symptoms

A characteristic symptom is the premature death of the older leaves, leaving the plant with a ragged appearance somewhat similar to the result of defoliation by target spot. Another characteristic is the appearance on the lower surface of the leaf of the velvety dark growth of the causal fungus. In the earlier stages of the attack, the leaves show indefinite yellow lesions on the top surface. Infection of the fruit is unusual, but the blossoms may be attacked and destroyed.

The cause and source of infection

The disease is caused by a fungus (*Fulvia fulva*). Spores are produced on the velvety

area on the lower side of the leaf and are spread by air movement. The first infections may occur because of spores blown from other diseased plants or from diseased plant remains in the soil.

Conditions favouring the disease

Humidity must be very high and temperatures warm before the disease spreads. In many countries throughout the world it is regarded as a glasshouse disease only, but in Queensland suitable conditions occur in the field in sub-tropical and tropical coastal areas.

Control

Regular spraying when required is an effective control. (See section on CURRENT RECOMMENDATIONS).

Sclerotinia Rot

Importance

Sclerotinia rot can be a destructive disease in every tomato growing district. It also affects many vegetables, ornamentals and weeds.

Symptoms

A light coloured rot appears on the stem, and the tip of the affected branch wilts. Small hard, irregular black bodies called sclerotia form inside the stem. The common size is from several to 10 mm long and up to 5 mm wide.

Cause and source of infection

The disease is caused by the fungus (*Sclerotinia sclerotiorum*). The sclerotia can survive for several years in the soil. In cool, wet weather they germinate to produce a

small, cream, mushroom-like body, (apothecium) at soil level. This apothecium has a diameter of approximately 10 mm and produces spores which are spread by wind and air currents. Sclerotia may also germinate and directly infect the plant.

Conditions favouring the disease

This disease is favoured by cool wet weather and serious losses occur in Queensland from April to September inclusive. Infection occurs at points of injury (by wire rubs) or where dead plant parts remain in contact with the plant, e.g., fallen blossoms, dying leaves.

Control

Do not plant heavily infested areas with tomatoes during the cooler months of the year. Spray with the recommended fungicide. (See section on CURRENT RECOMMENDATIONS).

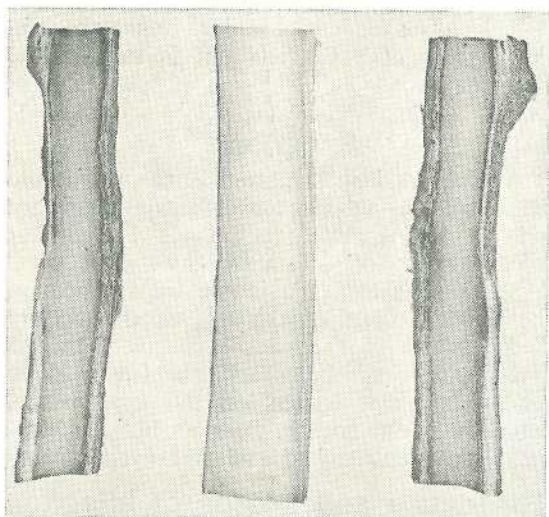
Fusarium Wilt

Importance

Fusarium wilt is widespread throughout Queensland but only causes significant loss if susceptible cultivars are grown in warm weather.

Symptoms

The first symptom is the cessation of growth but this frequently passes unobserved. The leaves near the base of the plant then start to turn yellow. A week to a month later, if the weather is warm, the entire plant wilts. Sometimes only one branch of the plant shows definite symptoms. Diseased leaves readily break away from the stem, and, if the bark is stripped off the plant just above the ground level, brown streaks will be seen in the woody water-conducting tissues. In severe cases the dark streaks extend around the entire stem, so that if the stem is cut across with a sharp knife a dark, narrow ring shows just inside the bark.



Fusarium wilt showing discoloration of water conducting tissues in the stem.

Cause and source of infection

This disease is caused by a fungus (*Fusarium oxysporum* f. sp. *lycopersici*) which penetrates the roots and grows up through the water-conducting vessels of the stems and leaf stalks. The fungus also occasionally grows from the stem into the developing fruit and infects the seed. There are two races of the fungus in Queensland and these are designated Race 1 and Race 2. Both are present in the Bowen area but only Race 1 has been found in the rest of Queensland.

The fungus carries over from season to season in the soil, and may be spread by soil washing across lower slopes, by implements, or by moving the residue of an infected crop to an uninfected area. The original infection may take place in the seedbed. Infection from seed is possible but very unlikely.

Conditions favouring the disease

It needs warm temperatures for its development and consequently affects plants only during spring and summer. Light-textured soils

tend to have a greater incidence than heavy soils, and an acidic soil also accentuates the trouble.

Control

This depends largely on decisions made prior to planting the seedbed. Resistant cultivars must be used for all warm weather plantings. (See section on CURRENT RECOMMENDATIONS). In the Queensland winter, it is possible to use some of the susceptible cultivars but this is not recommended and is justified only if there is some special reason.

Extreme care should be taken to prevent the introduction of the second race of the fungus from Bowen into southern Queensland.

The seedbed should be fumigated unless there is positive evidence that the soil is free of the fungus. (See section on CURRENT RECOMMENDATIONS).

Verticillium Wilt

Importance

The disease is most likely to be severe in cooler periods. Consequently it may be apparent in crops which mature from late autumn to early spring.

Symptoms

The symptoms are similar in some aspects to those already described for *Fusarium* wilt, both in the manner of wilting of the affected plants and in the discolouration of the water-conducting vessels. However the leaves of the infected plants tend to dry and wither without the preliminary yellowing which is characteristic of *Fusarium* wilt. There is also a tendency for the vascular darkening to occur only in the base of the stem.

Cause and source of infection

This disease is caused by a fungus (*Verticillium dahliae*). This fungus attacks a wide range of plants. The most likely source of infection is the soil, either seedbed or in the field. It is widespread in horticultural areas

of Queensland. Seed transmission of the fungus is also possible. It also infects Noogoora burr and movement of this weed in floods may be responsible for the introduction of the disease into clean areas. A prior potato crop may increase the probability and severity of the disease.

Conditions favouring the disease

Cool temperature is by far the most important factor favouring the development of the disease.

Control

If the disease is of regular occurrence in a particular area then resistant cultivars must be used. (See section on CURRENT RECOMMENDATIONS). Avoid the use of potatoes and tomatoes in the rotation. Seedbeds should be fumigated and every precaution taken to avoid introducing the disease into an area known to be free from it. (See section on CURRENT RECOMMENDATIONS). Noogoora burr is frequently infected with this fungus. Diseased plants should be destroyed by burning after harvesting the crop.

Sclerotium Fruit and Base Rot

Importance

The disease is of economic importance in southern Queensland especially at Stanthorpe during hot, early summer conditions.

Symptoms

The disease commonly attacks young plants 5–6 weeks old and occasionally younger plants in old seedbeds. The base of the tomato plant discolours to a purple dark-brown colour at and below soil level to a depth of 8 to 10 cm. The stem becomes girdled, and the plant wilts and may die.

A cottony white growth of mycelium may develop at soil level on the surface of the infected stem. Later, small, white, circular bodies about 1 mm in diameter (sclerotia) develop, and these soon change colour to brown and black. They resemble cabbage seed in appearance. Fruit which contacts the soil

may be attacked and become rotten and sclerotia form on and within the fruit.

Cause and source of infection

A common soil-borne fungus (*Sclerotium rolfsii*) capable of attacking a wide range of plants is the cause.

Conditions favouring the disease

It requires warm temperatures and moist soil conditions for its development.

Control

There is no treatment for the already infected plant. If relatively few plants are affected they should be removed, with larger roots, and burnt. If planting in a field where the disease was present the previous season drench the soil around the young transplants with a fungicide. (See section on CURRENT RECOMMENDATIONS).

Bacterial Wilt

Importance

In many coastal areas, bacterial wilt restricts tomato production to the cooler months of the year.

Symptoms

The most characteristic symptom is a rapid wilting of the plants especially when young and succulent. This is accentuated during the hot part of the day. Nevertheless, not all affected plants wilt, and stunting of plants is common and is often the first symptom. Other early symptoms include downward curling of leaflets and petioles. Where disease development is slow, excessive production of adventitious roots along the stems is common.

In severely affected plants which have not collapsed, a blackening of the stem at the base of a leaf, and possibly of some external parts of the stem, may also occur. If the stem is cut across at ground level, the water conducting vessels below the bark are often discoloured and sometimes a cream, slimy ooze can be seen. If a portion of cut stem is placed

in a glass of water, a milky ooze appears from the cut surface and forms visible spirals within the water.

The cause and source of infection

The disease is caused by a bacterium (*Pseudomonas solanacearum*) which is present in the soil. Although this bacterium will not survive for any length of time in dry soil, it is able to invade many common weeds where it survives from season to season. The following common weeds have been shown to harbour the organism—blackberry nightshade, thickhead, wild tobacco tree, Noogoora burr, hop bush, cobbler's pegs and spiny sida. Infection of the tomato may occur in the seedbed or in the field.

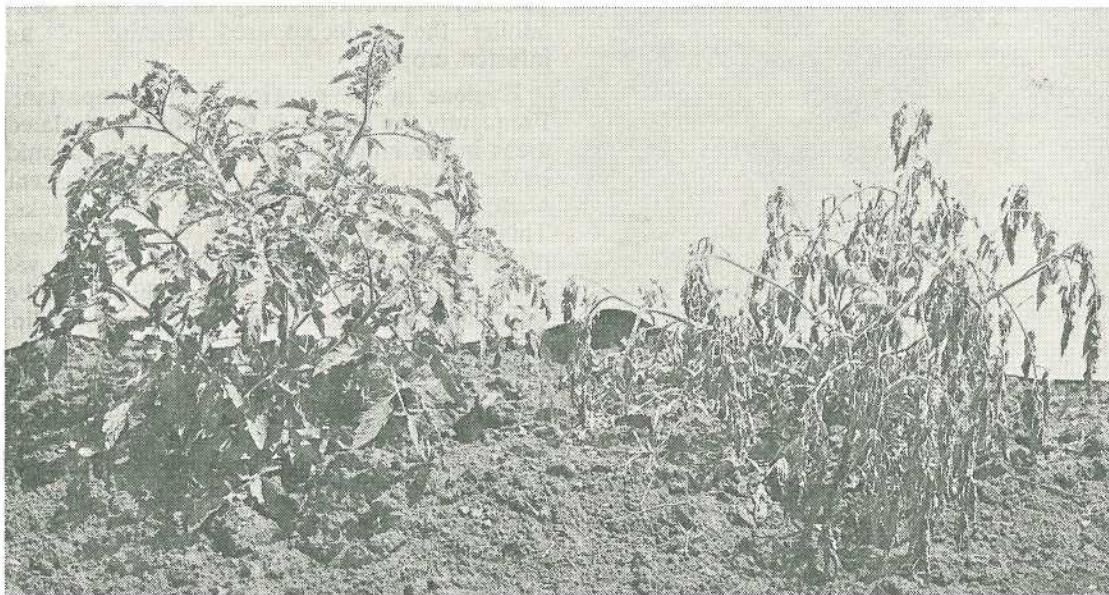
Conditions favouring the disease

The development is favoured by hot, wet conditions. If infection occurs in seedbeds, the additional healthy seedlings may be

infected during transplanting. If the soil in the field is infested, then the organism rapidly spreads through a crop via irrigation, and moves even more readily down a slope. Plant to plant spread also occurs by way of root contact.

Control

There are no resistant cultivars and soil fumigation is not effective. Every care should be taken to obtain uninfected soil for a seedbed. Do not use animal manure.



Bacterial wilt. Right: affected plant. Left: healthy plant.

Bacterial Canker

Importance

In the Stanthorpe district this disease regularly causes significant losses, but in most areas it is spasmodic in occurrence. It is more important for trellised and pruned crops.

Symptoms

The first foliage symptom is a wilting of leaflets on one side of the leaf. These become yellow to tan and dry out giving a one sided appearance to the leaf. If the petiole of the leaf is examined a yellow canker may occasionally be apparent. Sometimes one side of the entire plant is affected. As the disease progresses, tan coloured cankers may develop on the stem. When a diseased stem is split longitudinally, the vascular tissue is seen to

be discoloured tan to yellow and the discolouration extends into the petioles. The tissue in the centre of the stem becomes light tan with a mealy appearance and later cavities develop in this tissue.

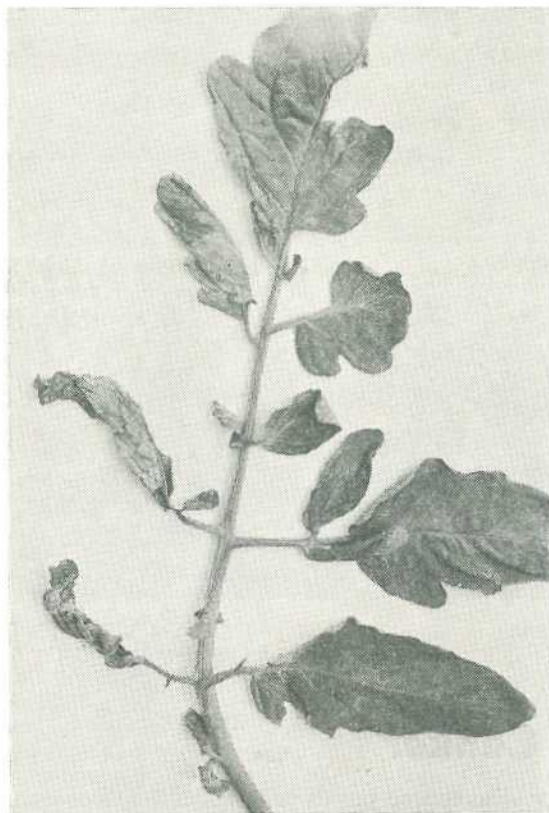
Fruit spots are circular, 1-3 mm diameter, with a raised brown central area surrounded by a white halo. As the spots develop, the central area cracks giving a rough appearance.

The cause and source of infection

The cause is a bacterium (*Corynebacterium michiganense*), which is commonly seed-borne. Transfer to healthy plants from adjacent diseased plants or undecomposed tomato residues is also possible.

Conditions favouring the disease

The disease is first established in the seedlings and after that the most important factor is the extent to which the farmer handles the plants at transplanting, trellising and pruning.

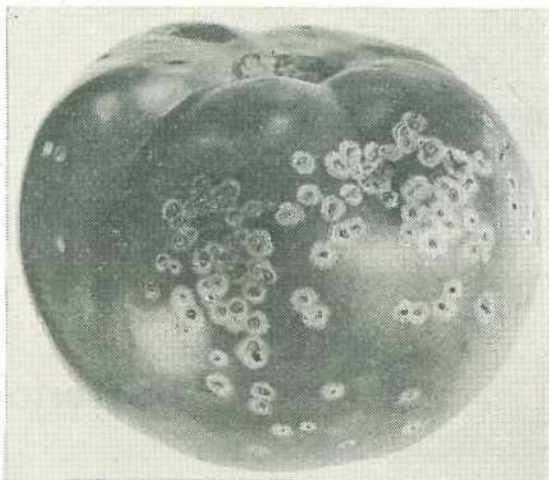


Bacterial canker showing wilting of leaflets on one side of the leaf.

Control

The most important factor is disease-free seed. If there is no such seed available the seed must be treated with acid or hot water. If a grower is keeping his own seed acid fermentation of the fresh seed is used. (See section on CURRENT RECOMMENDATIONS). Avoid planting in any area containing the undecomposed remains of an infected crop.

Hygiene in the growing crop is important. Frequently the disease is found only in isolated areas in the crop. The diseased plants should be destroyed and the next two or three adjacent plants should not be handled for several weeks. This will allow time for determining those plants which are already infected but not yet showing symptoms. Pruning tools should be disinfected with methylated spirits or formalin.



Bacterial canker on fruit.

Bacterial Spot

Importance

This disease occurs in all tomato growing areas but is rarely of major importance.

Symptoms

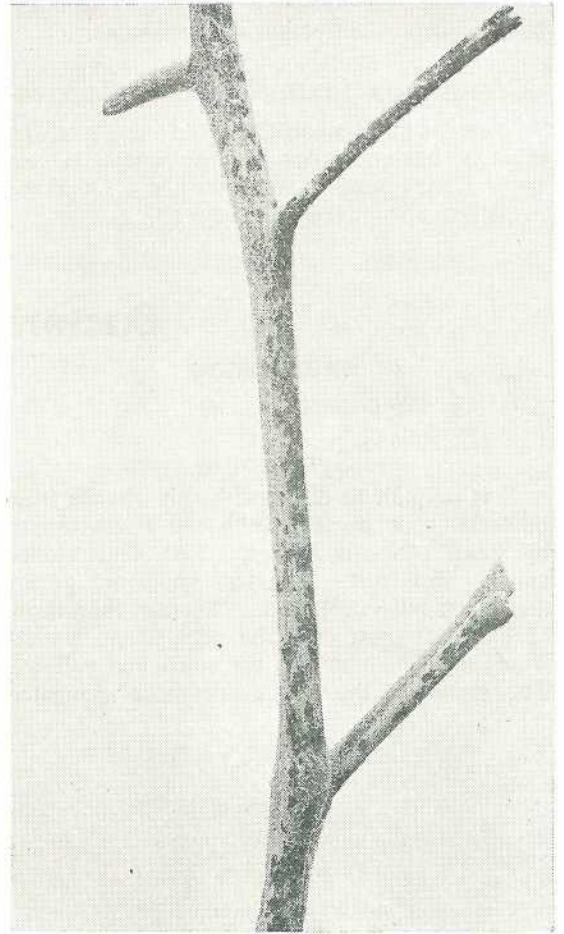
On leaves, leaf petioles, stems and fruit calyces, there is first a small greasy spot which becomes dark tan to black. These symptoms may appear on seedlings or larger plants. They may be restricted to the older leaves on mature

plants and cause some defoliation. This restriction to the older tissues will be due to an earlier period favourable to infection.

Immature fruits are susceptible but mature fruits are resistant. Small spots are formed which are raised, circular and black with a water-soaked margin. As the fruit enlarges the spots increase in size to 6-8 mm and become sunken with a central scabby area. Larger spots may be formed from smaller



Bacterial spot on leaves.

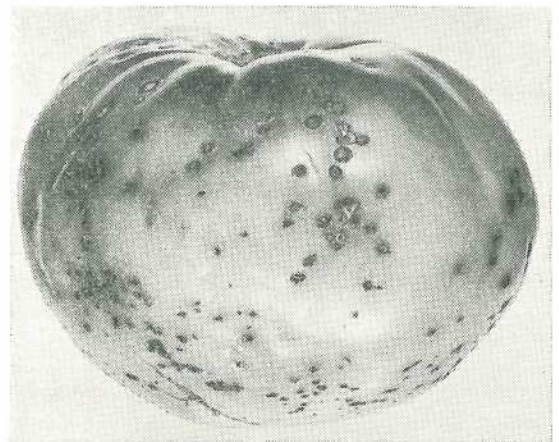


Bacterial spot on stems.

ones coalescing. Only the outer skin of the fruit is affected.

The cause and source of infection

The disease is caused by a bacterium (*Xanthomonas vesicatoria*). This organism is seed-borne as a result of contamination of the seed coat during extraction, and this is the most important source of infection. Undecomposed tomato debris in the soil may also harbour the bacterium. The organism is also known to live from one season to another on wild gooseberry, blackberry nightshade and other weeds. There are several races of this organism and all cause disease on tomato, but capsicum is resistant to some. In practice,



Bacterial spot on fruit.

we assume that diseased capsicums can also be a source of infection for tomatoes.

Conditions favouring the disease

Warm, humid weather favours the development of bacterial spot and the spread is very rapid during windy, wet weather. Overhead irrigation also favours its spread.

Control

The destruction of old crops is important. If seed is of unknown origin, it should be acid or hot water treated. Seedlings should be sprayed in the seedbeds. Regular spraying of the growing crop is necessary if wet weather occurs. (See section on CURRENT RECOMMENDATIONS).

Bacterial Speck

Importance

As for bacterial spot.

Symptoms

It is difficult to distinguish this disease from bacterial spot because both are characterised by small spots on leaves, stems, fruit stalks, calyces and fruit. The leaf spots are greasy and black but smaller on an average than those of bacterial spot. On the very young leaflets where spotting is severe, the entire leaf yellows. The spots on the stems are more elongated

than the leaf spot. The fruit spots are rarely greater than 1 mm in diameter, and are in the form of raised black specks which crack to give a characteristic appearance as the fruit develops. These specks remain surrounded by green tissues when the fruit ripens. Some coalescing of fruit spots occurs to give larger lesions. Fruit infection can also occur when the discolouration extends down the fruit stalk into the fruit tissue.

Cause and source of infection

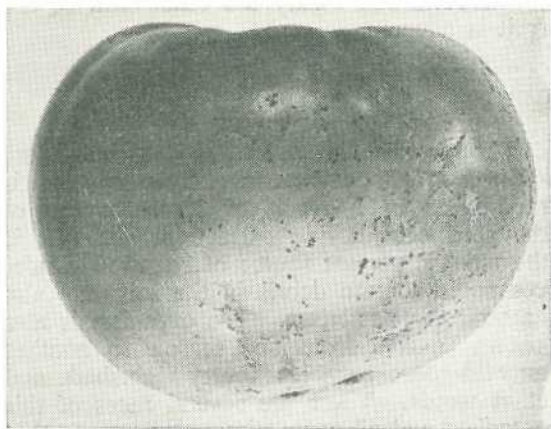
The disease is caused by a bacterium (*Pseudomonas tomato*) which is seed-borne usually as a contaminant of the seed coat. Infected or contaminated seed results in diseased seedlings which are the main source of infection in the subsequent crop.

Conditions favouring the disease and control

As for bacterial spot.



Bacterial speck on leaves.



Bacterial speck on fruit.

TARGET SPOT

DISEASES OF TOMATO - 1

TARGET spot, caused by the fungus *Alternaria solani*, is the most common disease of tomatoes in Queensland. Because it affects plants from the seedling stage to maturity as well as fruit, it is a potential cause of major loss in all areas.

Symptoms

Leaf symptoms consist of dark-brown, zonate spots, commonly up to 6 mm in diameter but as large as 12 mm in favourable weather, with definite margins and yellow edges. Spots on stems are more elongated and the 'target' appearance is more pronounced. An affected seedling shows a large, dry, dark, shrunken area on the stem near ground level. The plant is stunted and may snap off at this point. Fruit spots are black or dark-brown, oval to round, and occur commonly on the edge of the stem scar or around growth cracks. These develop more rapidly as the fruit ripens.

Spread

Large numbers of spores are produced on leaf and stem spots, and are spread from plant to plant by wind, rainwater and irrigation. As warm weather favours the disease, it is more likely to be a problem in the Autumn and Spring months. Nevertheless, it is present to some extent throughout the year and may still spread even in relatively dry weather. It develops more rapidly when plants are carrying the maximum load of fruit or when they are under stress.

Control

Control of target spot starts by planting certified seed into well-prepared seedbeds. It is preferable to use cultivars which are more resistant to the disease. Seedbeds must be sprayed regularly with a fungicide to prevent the seedling phase of the disease.

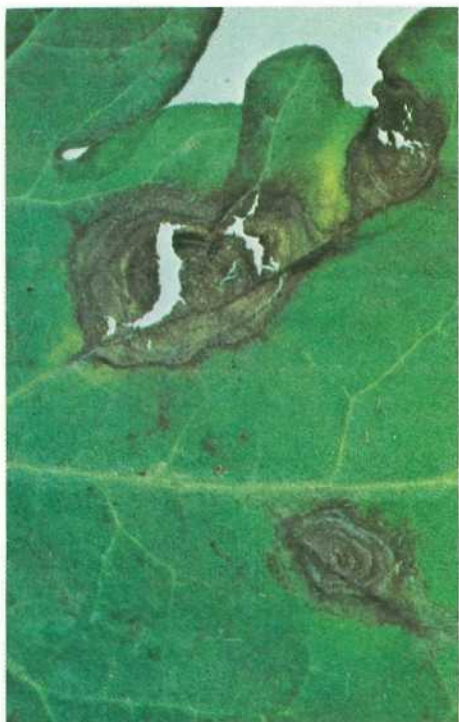
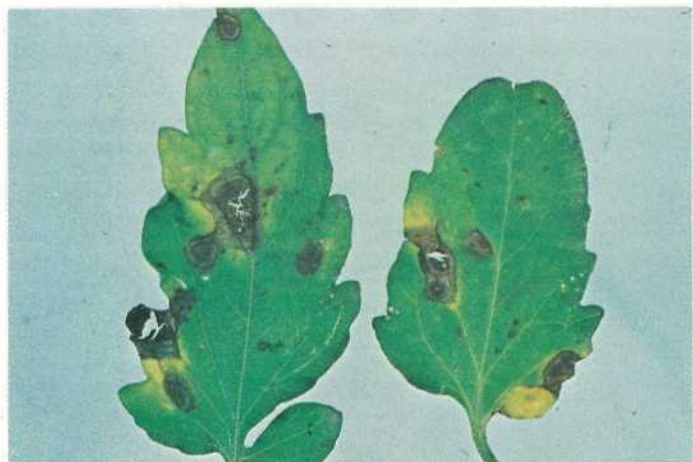
Seedlings should be transplanted into areas where tomatoes have not been grown for at least twelve months. Spraying the growing crop with a fungicide at regular intervals is necessary. To prevent carryover of the fungus from season to season, old tomato bushes should be destroyed as soon as harvesting is completed.

— Compiled by N.T. Vock, Plant Pathology Branch.

(Further information including recommended fungicides and cultivars may be obtained from your nearest Plant Pathology Branch office, or by writing to the Director, Plant Pathology Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Q. 4068).



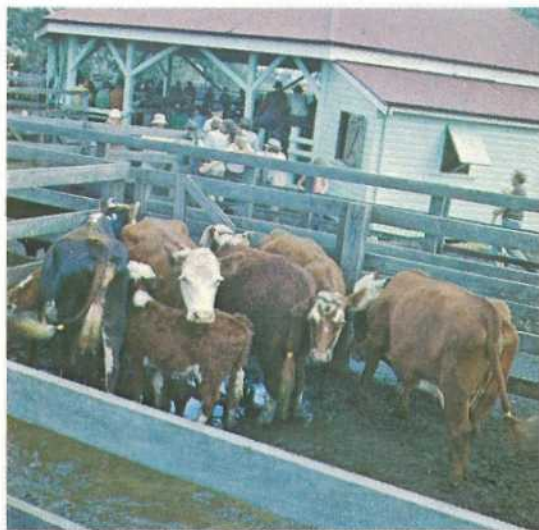
DISEASES OF TOMATO - 1



TARGET SPOT. Upper left: leaf spots. Upper right: close-up of leaf spots showing the 'target' appearance. Lower left: stem spot. Lower right: fruit symptoms.

What you should know about tail-tagging

TAGGING HAS BEEN INTRODUCED TO IMPROVE DISEASE CONTROL IN THE CATTLE INDUSTRY. THIS LEAFLET SHOWS HOW YOU CAN PLAY YOUR PART.



Tagged cattle boxed at a saleyard in northern New South Wales. The numbers on the tags positively identified the property from which each animal came.



A tail tag is wrapped just above the brush. Note that the number at the end of the tag will finish on the outside of the wrap.



The tagging is completed.



Right and Wrong. The tag on the right (tied in a 'bow') is difficult to read and is likely to drop off.



The animal on the left has been incorrectly tagged. Unless plastic to plastic adhesion is achieved by overlay, the tag is likely to drop off.



The tag should have been put on in the correct position despite the dung build up. It is plastic to plastic adhesion which gives a successful result.

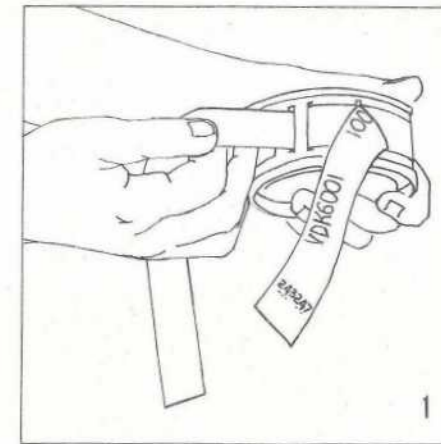
WHY IS TAGGING NECESSARY?

1. To satisfy overseas market requirements, and to protect the domestic consumer. Efficient abattoir monitoring is essential in the control of tuberculosis and brucellosis in the cattle industry. As a fringe benefit, it can effectively replace a great deal of testing for these diseases on the property thus reducing the need for repeated yarding of cattle. Abattoir monitoring is also needed for pesticide and acaricide residues in beef.
2. To enable surveys and other disease problems of economic and human health importance such as trichomoniasis, hydatids and beef measles.
3. To allow efficient control of an outbreak of exotic disease such as foot and mouth disease should it occur.

APPLICATION OF TAGS

Tail tags are supplied in waterproof plastic dispensers containing 25, 50 or 100 tags. Each tag carries the registered property number, which is repeated so that a clean number can be exposed if necessary by unwrapping the tag.

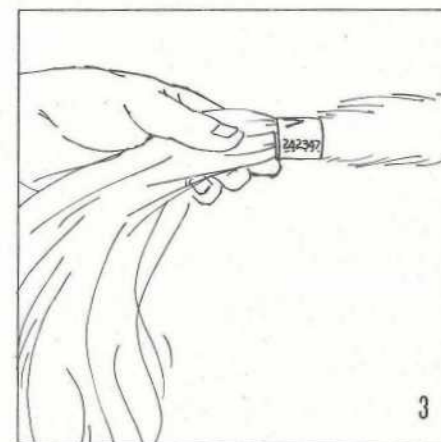
1. Ensure the dispenser is properly threaded and, withdraw the tag from dispenser. It should automatically peel from the backing paper.
2. Starting with the blank end of the tag just above the brush, wrap firmly around the tail so that the plastic overlays itself. The identification number will be exposed, and the serial number should be visible.
3. Smooth down any wrinkles.



1



2



3

WHEN TO TAG

The identification of cattle regulations (1976) require that every owner ensures that cattle about to be moved to any abattoir, slaughter-house or saleyard are tagged **before such cattle are travelled.** (Exemptions to these regulations are listed below).

Tagging may be done immediately prior to movement or it may be more convenient to tag beforehand, for instance when cattle are yarded for a final dipping. Tagged cattle can be dipped several times without significant tag loss.

APPROVED TAGS

The only tail tag approved for use in this scheme at present is the Paradar cattle tail tag.

Suitably engraved ear tags may be approved for use under some circumstances but cost more than ten times as much as tail tags.

EXEMPTIONS FROM TAIL TAG REGULATIONS

1. Calves under three months of age or suckling.
2. Drafts of cattle consigned direct to slaughter and otherwise suitably identified to the property of origin to the satisfaction of an inspector. The drafts must be of 20 or more head in K wagon or semi-trailer loads, transported direct to slaughter.
3. Movements direct from property to property except for movements to staging depots or dealers properties.
4. Movements to special store or breeder sales approved by a Divisional Veterinary Officer.
5. Cattle with the original tags still in place may be travelled or resold by the purchaser within the 30 days following purchase. For instance cattle purchased by a meatworks buyer will not require retagging provided that they are consigned to an abattoir within 30 days.

DISTRICT TAGS

The registration of properties in Queensland has been completed in readiness for tagging and each registered property has been allotted a number. District tags provide for the tagging of cattle from non-registerable properties such as Town Commons and Reserves and small holdings carrying less than 11 head.

HOW TO OBTAIN TAGS

Order forms are available at all stock inspectors' offices and must be countersigned by the stock inspector. Payment is made by cheque or money order for the correct amount payable to the manufacturer. The order forms are mailed by the owner and tags are returned direct from the manufacturer to the owner. Normal turnaround time is about three weeks, but on payment of an urgency fee this is reduced to something like one week.

District tags are normally available for immediate use from the inspector's office.

COST OF PARADAR TAIL TAGS

Per 100	\$2.80
Per 50	\$2.30
Per 25	\$1.75

These prices include return postage to the owner (surface mail).

REMOVAL OF TAGS FROM TAILS

Self adhesive tail tags will not restrict the blood supply to the tail. Tags may only be removed under the authorisation of an inspector.

OFFENCES

Unless covered by the exemptions listed, it is an offence to move from the property, cattle which do not bear the property identification number on an approved tag.

Stock agents could also be implicated in the committal of an offence if they sell untagged cattle knowing they should be tagged.

It is also an offence to alter or deface any tag or to attach to cattle a tag bearing identification numbers allotted to another owner. Tags cannot be borrowed.

INTERSTATE MOVEMENTS

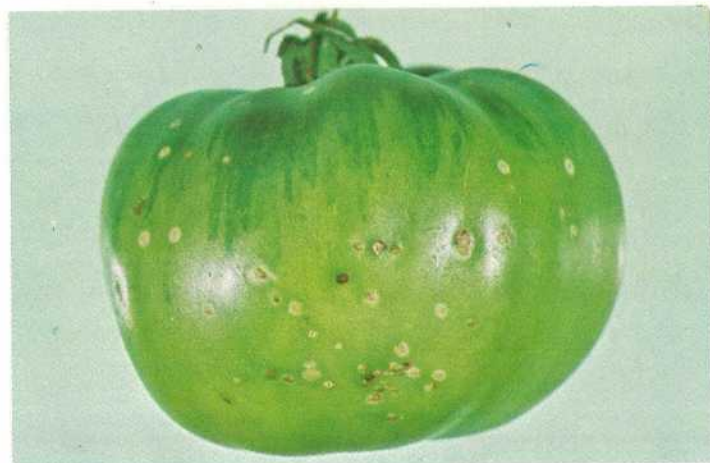
Tags are required on cattle moving to New South Wales and South Australia with some exemptions. You are advised to check with your local stock inspector.

FURTHER INFORMATION

Details of the Queensland scheme and of interstate requirements are available from the offices of all Department of Primary Industries' stock inspectors and veterinary officers.



DISEASES OF TOMATO - 2



BACTERIAL CANKER. Upper left: leaf stalk showing the characteristic one-sided dying of leaflets and the development of cankers. Upper right: affected stems. Note the peeling away of the outer part of the stem. Lower left: fruit symptoms. Lower right: close-up of the fruit spots.

BACTERIAL CANKER

DISEASES OF TOMATO - 2

BACTERIAL canker, caused by *Corynebacterium michiganense*, occurs spasmodically in most tomato-growing areas of Queensland and causes regular, significant losses in some districts. The disease is most important in trellised and pruned crops where plants are handled regularly. The bacterium causing the disease is seed-borne.

Symptoms

All parts of the plant may be affected by this disease. It first shows as a wilting of leaflets on one side of the leaf. These yellow and die, giving a one-sided appearance to the leaf. Sometimes, only one side of the plant is affected. As the disease progresses, light-brown cankers develop on the stem and leaf stalks. When a diseased stem is split lengthwise, a brown discoloration of the water-conducting tissues adjacent to the central pith will be seen. This may extend into the leaf bases. With time, the tissues in the centre of the stem become brown, appear mealy and cavities develop.

Fruit spots are circular, 1 to 3 mm across with a raised, brown, central area surrounded by a very definite white halo. As the spots age, the centre cracks giving a ragged appearance.

Spread

The disease is commonly introduced in contaminated seed. Once established, further spread depends on how much the plants are handled at transplanting and particularly during trellising and pruning. Spread may also occur to healthy plants from undecomposed tomato trash. The canker bacterium may also survive from one season to the next on weeds such as blackberry nightshade.

Control

Control of bacterial canker depends firstly on the use of certified seed. If none is available, treat the seed in acid or hot water.

Seedbeds should be frequently relocated to avoid build up of this and other diseases. Avoid transplanting into areas containing undecomposed remains of a previous tomato crop.

Hygiene in the growing crop is also important. As the disease frequently occurs only in isolated areas of the crop, affected plants in these areas should be destroyed and adjacent plants not handled for several weeks. This allows infected plants not yet showing symptoms to be determined. Pruning tools should be disinfected with methylated spirits or formalin. Keep headlands free of weeds at all times.

— Compiled by N.T. Vock, Plant Pathology Branch.

(Further information including recommended fungicides may be obtained from your nearest Plant Pathology Branch office or by writing to the Director, Plant Pathology Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Q. 4068).

Pith Rot

Importance

This disease is spasmodic in occurrence and of minor importance. It occurs most frequently in very vigorous crops.

Symptoms

The wilting of individual branches of a plant is usually the first symptom. The stem may show longitudinal cracks which expose a hollow centre, or in the absence of a crack the stem can be easily flattened between the thumb and fingers. The hollowing may be so extensive that the whole plant dies. The hollow centre is olive green to dark brown in colour and dry.

The symptoms can be confused with bacterial canker. The latter disease has a yellowish bacterial slime in the cavities in the stem and is characterised by a wilting of the leaflets on one side only of the leaf.

Cause and source of infection

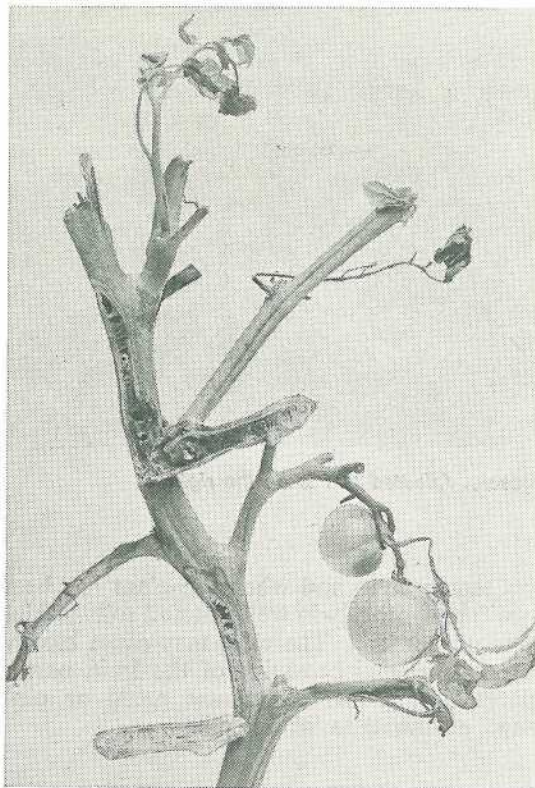
The rotting of the pith is due to a number of soil-borne organisms which infect damaged tissues such as pruning wounds. It is suspected that the primary cause is an imbalance in fertilisers, possibly excess nitrogen in the ammonium form.

Conditions favouring the disease

Rapidly growing plants are most likely to be affected and possibly some cultivars are more likely to be affected than others.

Control

No control is available and it is doubtful if one is necessary. The most important point from the grower's side is to know the difference between pith rot and bacterial canker.



Pith rot.

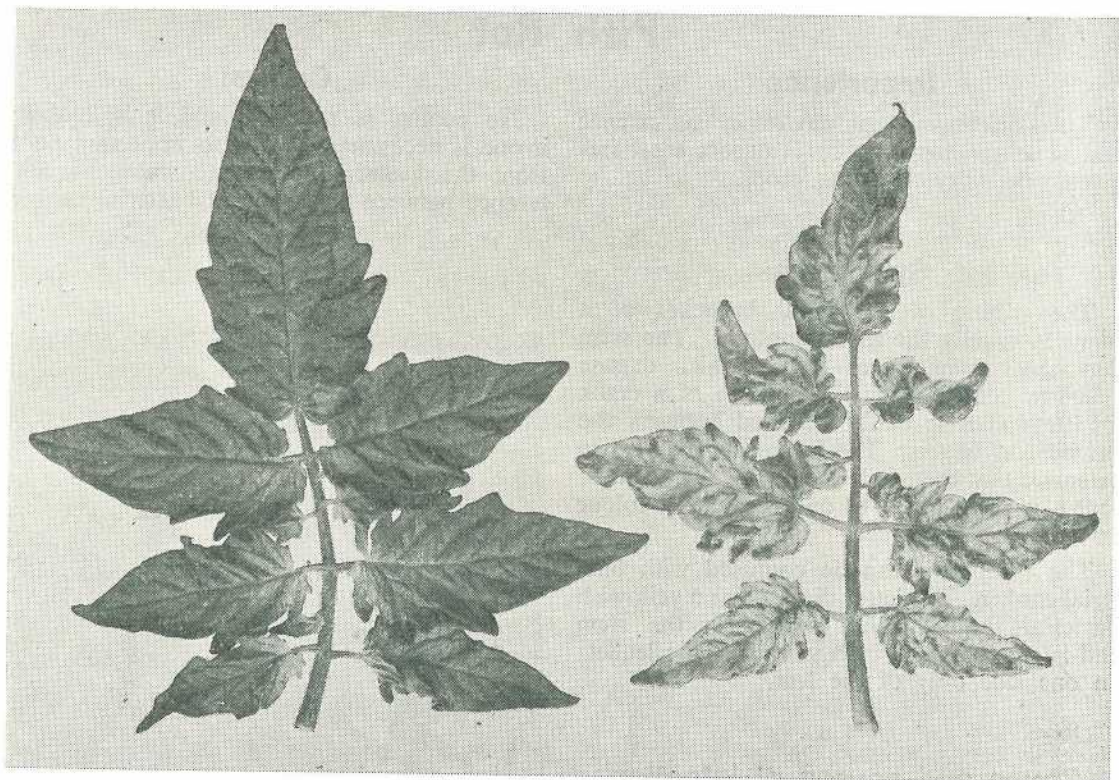
Mosaic

Importance

The disease is widespread and causes considerable reduction in yield if the plant is infected early. Late infections reduce fruit quality. Pruned or trellised crops are more commonly affected than ground crops.

Symptoms

Affected plants are, in general, a lighter green colour than healthy tomatoes and the foliage is slightly crinkled. Individual leaves show a mottle of light and dark-green areas, which is most pronounced after a period of



Mosaic. Affected leaf is on the right.

low temperature and when the plant has been growing vigorously in well-watered soils of high nitrogen content. The virus may cause blotching and internal browning of the fruit, particularly if it is at the mature green or pink stage at the time of infection.

The cause and source of infection

The disease is caused by tobacco mosaic virus, which is most commonly introduced into a crop by either seed or infection through diseased tomato-root debris in the soil. Virus on clothing, old trellis materials and in smoking tobacco may be a source of infection. The spread from weeds and crops related to tomato, such as capsicum, tobacco, cape gooseberry and blackberry nightshade, is also possible.

Conditions favouring the disease

Tobacco mosaic virus is very infectious and is very readily transmitted by hands, pruning knives and implements. This accounts for most new infections in a growing crop. For example it may be noticed to spread along a row of trellised tomatoes rather than to the nearest plant in the adjacent row.

Control

All old crops of tomatoes and related species must be destroyed before planting the new crop. In addition, volunteer plants of tomatoes and related species, including weeds, should be removed. Growers saving their own seed should treat the pulp with hydrochloric acid. Previously cleaned but untreated seed should be treated with trisodium phosphate. Commercial seed has already been treated.

Resistant cultivars should be used. (See section on CURRENT RECOMMENDATIONS).

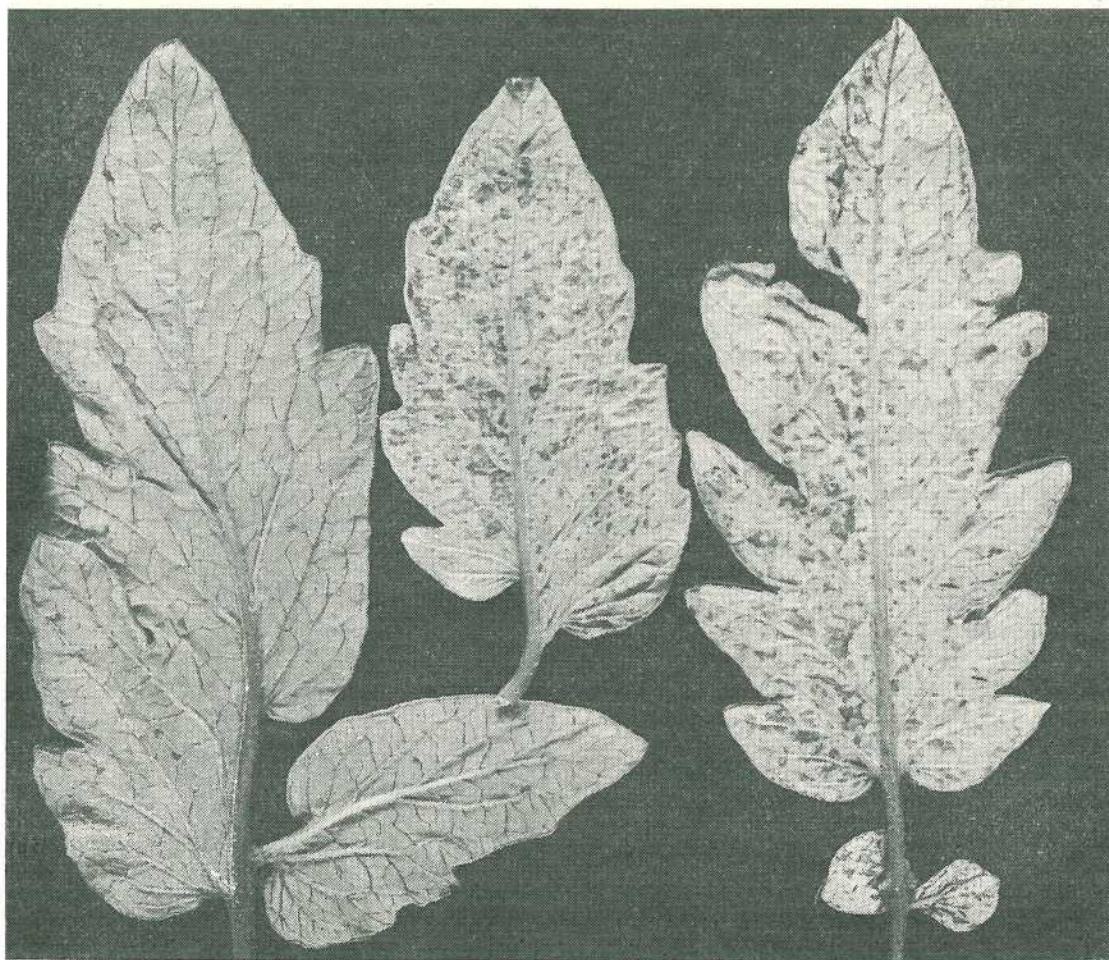
Seedbeds should be very carefully examined for diseased plants and the latter rogued out. Do not handle seedlings in the seedbed. Older crops frequently have some mosaic infected plants. To avoid transfer to seedbeds and younger plants the latter should be tended early in the day.

If occasionally it is necessary to handle older plants first, then the hands should be

scrubbed with soap and water and dipped in a 3% solution of trisodium phosphate. Knives and other implements contacting older plants should be treated with the same solution or 4% formalin.

Inspections during the early life of the crop are important. It is recommended that diseased plants be removed and destroyed if the number is relatively low, say fewer than 5%, particularly if the crop is to be trellised. Also workers should not smoke while working in the crop.

Leaf Shivel



Leaf shivel.

Importance

The disease can cause considerable reduction in yield in susceptible varieties during the cool part of the year. It has not been obvious in recent years. This may be due to the present popular varieties having some resistance, or to the reduced importance of the winter-setting crop in some areas.

Symptoms

The affected younger leaves become curled with a slight mottling. With age, a dark grey to brown spotting appears on the undersides of the older leaves which are crinkled, curled downwards and brittle. These older leaves then die and produce the characteristic shrivelled lower leaves. Once the grower is familiar with the disease he may recognise the early symptoms of a slowing down in growth and a slight yellowing of the young top growth with leaves a little more crinkled than usual.

The cause and source of infection

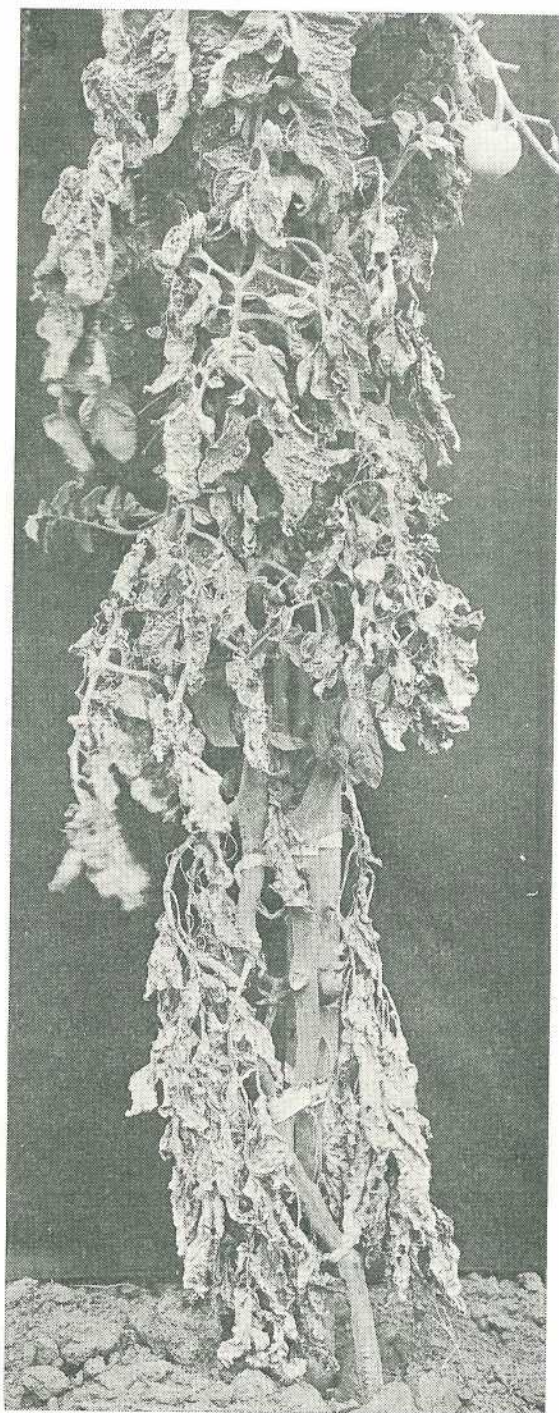
The disease is caused by potato virus Y (PVY) which is spread by aphids. This virus can also be spread by handling but in practice this is very unlikely. The source of the virus may be weeds, e.g., cape gooseberry, apple of Peru, blackberry nightshade, or other cultivated crops, e.g., tomato, capsicum or tobacco.

Conditions favouring the disease

The disease is most severe in the winter and a susceptible cultivar may show 100% infection. Nevertheless, the virus is frequently present in the host in the warm season, but not producing obvious disease symptoms. Very severe symptoms and a collapse, with symptoms similar to those of *Fusarium* wilt, may occur when the tomato plant is simultaneously infected with tobacco mosaic virus.

Control

There is no treatment of the diseased plants and no cultivars are known to be resistant. Old crops of tomatoes and other cultivated susceptible crops must be destroyed and known weed hosts removed from areas adjacent to the future crop area. If capsicums are to be grown concurrently, then a cultivar resistant to potato virus Y should be used. Aphid control in the seedbed is important.



Leaf shrivel. Later stage of the disease.

Big Bud

Importance

Usually only occasional plants are seen and these are scattered randomly in the field.

Symptoms

The most characteristic symptom is the malformation of the flower from which the name of the disease is derived. The flower stalks are thickened and the flowers distorted by an enlargement and greening of the floral parts. Another symptom is "rosetting". In this case multiple shoots are produced in the leaf axil. Prior to these obvious symptoms there is a cessation in growth of the stem, which is often followed by a purpling of the growing tip, and the flower hands pointing upwards instead of curving downwards.

The cause and source of infection

The disease is caused by a mycoplasma. The source of infection may be weeds, cultivated plants or possibly native plants. On these other hosts, the symptoms are often "greening" of the flowers and a rosette effect (of reduced leaves). The mycoplasma is spread from plant to plant by a leafhopper and cannot be spread by handling or by seed. Disease symptoms do not appear until at least three weeks after infection.

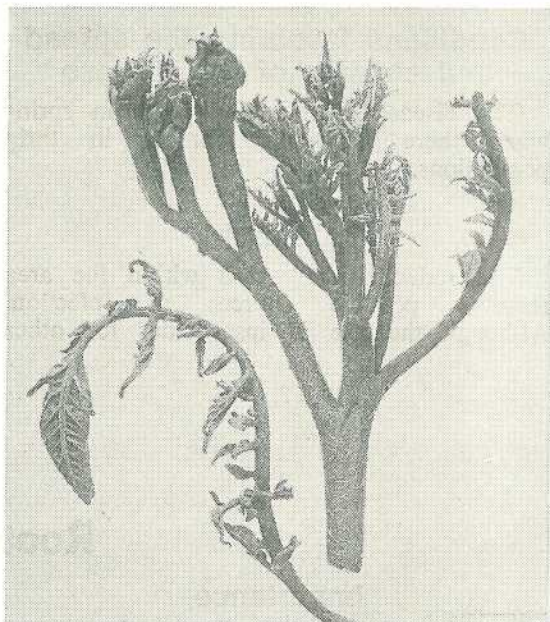
Conditions favouring the disease

Conditions which influence the movement of the leafhopper are the most important. For example, if the weather is very dry and the vegetation dries off around an irrigated field of tomatoes, then the insects will move in to the green crop. If this coincides with the leafhoppers being infective, then a high rate of infection may result. The subsequent spread

from plant to plant in the crop is usually very limited.

Control

The reduction of weeds in the adjacent areas reduces the chance of leafhoppers becoming infected. It is too late to attempt control of the insect when symptoms appear and the disease is too spasmodic in occurrence to justify regular preventive spraying. Experience has shown that some districts are more likely to have this disease and that a dry spring is the most likely season for infection. The final decision must be made by each grower in the light of his local experience whether or not he applies sprays to control insects.



Big bud.

Spotted or Bronze Wilt

Importance

This disease is of minor importance in commercial crops on coastal areas. It is more likely to be present in the Lockyer and Stanthorpe districts and in home gardens. Spotted wilt is the international name of this disease but many local growers call it bronze wilt.

Symptoms

The symptoms of this disease are the cessation of active growth, the bending downwards of the leaf stalk, the incurving of the blades of the leaflets, and the purplish-brown leaf-spots which are often crescent shaped and approximately 3 mm in length. The affected

leaves sometimes have an overall reddish-brown to bronze colour. Dark streaks can appear on the stems near the growing point when symptoms are severe. The affected leaves wither and finally dry. The ripening fruit from affected plants often shows pale ring-spot lesions.

The cause and source of infection

This disease is caused by tomato spotted wilt virus (TSWV) which is spread by thrips. The virus also affects a number of ornamental plants and weeds. It is not seed-borne and is not spread by handling and pruning. The chief sources of the virus are infected weeds and ornamental plants.

Conditions favouring the spread and severity of the disease

The disease commonly appears in spring when there is rapid increase in thrip populations.

Control

The reduction of weeds within the area removes possible sources of infection. Although the use of insecticides for other

insects will ensure adequate control of thrips in the crop, some infection may come from weeds on the headlands.



Spotted or bronze wilt.

Root-knot

Importance

Root-knot is a serious disease of tomatoes particularly on light, sandy soils in the warmer months. It also affects tobacco, beetroot, carrot, ginger, strawberry, peanut, peach and other crops.

Symptoms

The roots of diseased plants are galled, the swellings varying in size from about one millimetre in diameter to large tumours involving the entire root system. Badly diseased plants are stunted, of poor colour, wilt readily on hot days, crop poorly and die prematurely.

Cause and source of infection

The disease is caused by root-knot nematodes (*Meloidogyne* spp.). The infective stage is a small threadlike larva about half a millimetre in length which develops into a worm-like male or pear-shaped female. The latter can be seen with the naked eye as small white bodies when old galls are opened.

Nematodes commonly occur in virgin soils. They are distributed in planting material, by cultivation and in soil adhering to man, animals and farm equipment.

Conditions favouring the disease

The effect of the infestation is increased markedly if growing conditions for the host plant are not kept at or near the optimum. More severe symptoms occur in summer when the life cycle of the nematode takes a shorter time to complete.

Control

If the previous crop has been infested then it should be ploughed out immediately after

harvesting in order to expose the infested roots to the sun.

Avoid cover crops such as cowpea, mung bean and velvet bean which are themselves susceptible and capable of maintaining high populations of root-knot nematodes in the soil.

The seedbed should be treated with a recommended fumigant and the field soil should also be fumigated (See section on CURRENT RECOMMENDATIONS).

Damping Off

Importance

The disease is of minor importance in well prepared seedbeds but growers should always be prepared because it develops very rapidly.

Symptoms

In post-emergent damping off, the seedlings fall over without any prior wilting of the cotyledons or young leaves, and the stem is shrivelled and water soaked at soil level. In pre-emergent damping off, the seed rots in the soil and seedlings do not appear. The former is more likely than the latter.

Cause, source and spread of disease

Several fungi (*Pythium* spp., *Phytophthora* spp., and *Rhizoctonia solani*) are responsible

for this disease. They are commonly present in the soil but they are only active when excess moisture is present.

Control

Seed-bed management is very important. Do not plant seed too thickly, avoid excessive watering of the seed-bed and do not restrict ventilation, particularly after the seedlings come up.

If the disease appears then apply a fungicidal drench immediately (See section on CURRENT RECOMMENDATIONS). If this disease occurs regularly, then the seed-bed should be fumigated before planting seed. (See section on CURRENT RECOMMENDATIONS.)

Post-harvest Fruit Rots

Importance

Efficient growers are rarely troubled except in periods of prolonged wet weather.

Symptoms

These vary because of the number of different organisms involved. There are however three groups of symptoms which are commoner than others—

(i) clearly defined black to dark brown oval to round spots which are

frequently associated with the edge of the stem scar, radial cracks, the fine cracks on the shoulder of the fruit or mechanical wounds;

(ii) relatively large areas of the fruit are affected but the margins of these areas are not clearly defined and the fruit retains its shape;

(iii) the entire fruit collapses into a soft and watery consistency.

Cause and source of infection

The first group of symptoms described above are commonly the result of infection in the field prior to harvesting and are caused by a number of fungi, including those responsible for target spot and Phoma rot. The second group of symptoms is also caused by species of fungi, *Pythium* spp. and *Phytophthora* spp. Most of these are from the soil, but the Irish blight organism is occasionally involved. The third symptom of a soft and watery rot is usually the result of infection by organisms associated with decaying organic matter, e.g., *Erwinia carotovora* (a bacterium) *Rhizopus* spp., and *Oospora* spp.

These organisms are likely to become established around packing houses. Thus the source of infection is frequently post-harvest. Occasionally severe field infection by the Irish blight organism also gives a soft rot.

Conditions favouring the disease

Heavy rains just prior to and during harvesting are a major factor favouring post-harvest rots. This is due to an increase in fruit cracking, increased mechanical damage from adhering soil and excess moisture on the fruit itself. Subsequent washing, long periods between harvesting and selling or processing, and extra handling also increase the incidence.

Control

The recommendations for post-harvest handling should be followed in detail. A fungicidal dip is recommended for control of fruit spots caused by *Alternaria* spp. (See section on CURRENT RECOMMENDATIONS.)

General Control Measures

Preplanting precautions

Destruction of old crops and weed hosts

Old vines should be destroyed immediately after harvesting. This recommendation is neglected by many growers but it is a very important factor in the control of many diseases. The plants should be pulled out with the major part of the larger roots intact and collected into heaps and burnt. The fallen debris should then be ploughed under to accelerate decomposition. A following cover crop further assists decomposition. Volunteer plants of related crop species and other susceptible weeds should be destroyed in areas adjacent to field plantings. The weed species most likely to harbour tomato pathogens are blackberry nightshade, wild gooseberry and Noogoora burr.

Rotation and cover crops

Rotation with cover crops is an important factor in efficient management of the soil. The crops used must not be susceptible to the

pathogens causing tomato diseases. Recommendations are oats or rye at 45–50 kg per hectare for winter, and maize at 45–50 kg per hectare for summer. If a longer term crop is required use green panic, 3–4 kg per hectare. The cash crops in the rotation should not include potato, capsicum and eggfruit.

Location of field site and time of year

Sites which favour the drying of moisture from the foliage are recommended, e.g., north to north-easterly slopes. For the same reason, rows of trellised crops are better running north and south because this ensures maximum penetration of sunlight and warmth during the winter. Fields infested with the bacterium causing bacterial wilt should be used only for winter crops. On the other hand, if the leaf shrivel virus is present in the district, tomatoes should not be grown during winter and early spring. *Fusarium* wilt is more severe in warm weather and *Verticillium* wilt in cool weather. Cultivars susceptible to these diseases may be grown in the seasons least favourable to the disease in question.

Treatment of old trellis materials

Used trellis wires and posts should be treated to inactivate any tobacco mosaic virus particles. (See section on CURRENT RECOMMENDATIONS.)

Fumigation of soil

For special reasons a grower may wish to treat the soil to control *Fusarium* or *Verticillium* wilts or nematodes. This will require a broad spectrum fumigant. The instructions for use of the fumigant should be followed very carefully. In some instances, a period up to six weeks is required after treatment in order to avoid toxic effects on plants. Once the soil is treated, take strict precautions to prevent recontamination.

Seeds and management of seed-beds

Certified seed

This is important as a general recommendation but it is of vital importance for the control of tobacco mosaic virus and bacterial diseases other than bacterial wilt. The seed is produced from plants which have been inspected and certified free of these diseases. The list of cultivars which are available as certified seed is given later. (See section on CURRENT RECOMMENDATIONS.)

Disease resistant cultivars

The selected cultivar should be resistant to *Fusarium* wilt and tobacco mosaic virus unless there is good reason to omit these precautions. Resistance to leaf diseases is not absolute and the recommended sprays still need to be used. However, the diseases are easier to control on cultivars which are resistant. The cultivars resistant to the various diseases are listed later (See section on CURRENT RECOMMENDATIONS).

Seed treatment

There are two reasons for treating the seed, namely (i) to destroy any organisms or virus on or inside the seed and (ii) to protect the seed from damping off and root diseases in the seed-bed. There are several treatments available for the first purpose and these differ

in their ability to control the different groups of causal agents, namely viruses, bacteria and fungi (See section on CURRENT RECOMMENDATIONS). Routine seed treatments are necessary in order to consistently control disease.

Seedbed management

The seedbed should be located as far as possible from likely sources of tomato diseases. Obviously it should be well clear of any growing tomato crop which is likely to be neglected. A situation near the house is undesirable because household refuse, especially from tomatoes and potatoes, can initiate infection, and some ornamental plants act as reservoirs of the causal agents of tomato diseases. All weeds adjacent to the seed-bed must be either destroyed or consistently sprayed against aphids. Definite care is required to prevent contamination of the seed-bed by soil from implements and boots. Surface water can also carry contamination. New seed-beds therefore should be protected from drainage, e.g., by not planting them on a slope below a previous bed. Too much shade should be avoided.

Soil should be fertile, well drained and not have recently grown a solanaceous crop. Animal manures should not be used because they have been associated with outbreaks of bacterial wilt. The plants should be raised in rows and thinned if necessary to permit good air circulation, efficient spraying and weeding. Fungicidal sprays should commence when the first true leaves are approximately 30 mm long and be applied at 7 day intervals. They should be applied at half the strength used for the crop in the field. In cool dry weather, the spray interval may be increased to 10 days.

Seedlings for transplanting should not be stood in water. This permits diseases like bacterial wilt, bacterial canker and possibly tobacco mosaic to be spread throughout the batch. Use wooden boxes with a damp layer of sawdust or paper on the bottom, and do not pack tightly. Implements and boxes should be washed with a suitable chemical to inactivate any virus (See section on CURRENT RECOMMENDATIONS). Workers should not smoke while handling seedlings and their hands should be washed in a solution to inactivate any virus before handling seedlings.

The growing crop

Application of fungicides

These notes are restricted to general comments on the use of fungicides. The particular compounds and the recommended concentrations for each disease are given later, and this list will be revised and issued separately as required (See section on CURRENT RECOMMENDATIONS).

Most of the fungicides are protectants and non-systemic, i.e., their action is limited to that part of the plant where they are situated. Consequently they must be applied to the plant before it becomes infected, and must be distributed over as much of the plant surface as is reasonably possible. The distribution depends on careful application of spray and later redistribution by irrigation and rain. The copper compounds and the dithiocarbamates (ziram, zineb, maneb, propineb, mancozeb, metiram) are in this group.

The second group are both eradicant and systemic, i.e., the fungicide may have an effect on a parasite on the opposite side of the leaf from that where it is placed or may even be transported to other parts of the plant in the vascular system. These fungicides are able to control a disease if they are applied a short time after infection. The benzimidazoles (benomyl, carbendazim and thiophanate methyl) are examples.

No one fungicide is the best for all diseases. Benzimidazole compounds have had extraordinary success for a number of fungal diseases but they are ineffective against many others including target spot.

Fungicides which contain the same, or very similar, active constituents are not always equally effective. The ability to mix thoroughly in water, spread on a leaf and adhere to the leaf after application are all very important and effect the efficiency of the spray.

Compatibility

Problems may arise when fungicides and insecticides are mixed but there is usually clear warning of this on the labels of the containers. Mixtures of copper compounds and dithiocarbamates must be used immediately because of a breakdown in the fungicidal effect.

Method of application

Three methods of application may be used:

- (1) liquid suspension as a high volume spray, i.e., more than 1 200 litres per hectare;
- (2) liquid suspension as a low volume spray, i.e., less than 500 litres per hectare applied as a fine mist;
- (3) a dry application applied as a dust.

The first is by far the most common because it can be applied over a greater range of conditions. Misting and dusting applications give a better penetration of dense foliage but are very sensitive to wind. Dusts can be applied very rapidly but are easily washed off by rain or overhead irrigation. Whenever possible the high volume spray application is recommended.

Basic spray programme

Some diseases almost invariably appear in the seed-bed and field. Consequently a basic spray is usually applied from the time seedlings emerge and regularly in the field. The best fungicides for this purpose are those recommended for target spot. (See section on CURRENT RECOMMENDATIONS).

Harvest and post-harvest

The most important factor is cleanliness and removal of discarded fruits from the grading and packing area. This includes cleaning out plant trash from the grader. Rough handling either by pickers or when packing, and long holding periods also increase troubles.

Avoid picking in wet weather. The fruit remain wet in containers and are more likely to have sand and soil sticking to them. This increases damage to the skin and provides an inoculum of soil bacteria to exploit these injuries. Occasionally a fruit dip is required for a particular disease. (See section on CURRENT RECOMMENDATIONS).

Current Recommendations

Resistant cultivars

Bacterial spot

The fruit, but not the foliage, of Grosse Lisse and Q₂ has some resistance. Also some of the cultivars being considered for processing are relatively resistant.

Fusarium wilt

Cv. Walter is the only one which is resistant to both races of the Fusarium wilt organism. It must be used in the Bowen area and is also suitable for other areas.

Cvs. Floradel, Floralou, Indian River, Manapal, Strobelee and Tropic are resistant to race 1 only and are recommended for areas other than Bowen.

Grey leaf spot

Cvs. Floradel, Floralou, Indian River, Strobelee, Tropic and Walter are resistant. The widespread use of these cultivars has reduced considerably the incidence of this disease.

Leaf mould

Cvs. Floralou and Indian River are resistant to the strains of this pathogen which are common at present in Queensland.

Target spot

Cvs. Floradel, Floralou, Indian River and Tropic and some of the cultivars being considered for processing are partially resistant.

Tobacco mosaic virus

Cvs. Floradel, Floralou, Indian River, Strobelee, Tropic and Walter are resistant.

Verticillium wilt

Tropic is the only cultivar recommended.

Certified seed

Certified seed is available for the following cultivars: Floradel, Indian River, Q₂ (derived from Grosse Lisse), Strobelee, Tropic and Walter.

Seed treatments

Five treatments are listed below for the control of pathogens carried in or on the seed and one for protection of the seed from pathogens occurring in the soil. Note carefully the limitations of the various treatments. Acid extraction of seed is common and if this has been done, the chance of a seed-borne disease has already been reduced considerably. If, however, there is no guarantee that the seed has been acid extracted, then treatments (ii) and (iii) below are equally effective when applied to the dry seed. This level of control is frequently sufficient. If a pathogen is within the seed, then treatment (v) i.e., hot water, is necessary.

The decision whether or not to use the hot-water treatment is influenced by several factors. Growers have found it difficult to control the temperature, and seed which is not fresh and in good condition may have its germination reduced if there is a delay of weeks before planting. Consequently growers have often chosen to take a chance with some diseases and use only the more convenient methods. More recently a method of controlling the temperature has been developed which uses an electric fry-pan or deep-fry. This is distinctly easier than some of the previously recommended methods and growers are recommended to ask the nearest adviser in horticulture for details of the method.

(i) Acid extraction of seed for the control of bacteria and viruses on the *outside* of the seed coat: when extracting seed from the fresh fruit the grower should not depend on natural fermentation. To the extracted pulp (in a non-metal container) add 30 ml commercial hydrochloric acid for the pulp of each 2.5 kg of fruit or 1-2 litres of pulp. Stir well and stand for 3 hours, stirring again at intervals. Then decant off as much liquid as possible and wash thoroughly either by repeated decanting or against a screen with water from a hose. Non-metal screens should be used because metal screens may discolour the seed in the presence of acid. Dry the seed as quickly as possible by spreading it out in a thin layer on absorbent material. Do not put it in the direct sunlight and ensure that there is air movement over the seed.

(ii) Acid treatment of dry seed for the control of bacteria and viruses on the *outside* of the seed coat: This treatment need only be used if the seed was not extracted in acid. Soak the seed in a solution (in a non-metal container) made up of 50 ml of commercial hydrochloric acid in one litre of water for one hour, stirring occasionally. Wash several times by rinsing and decantation or with a hose against a screen and dry as quickly as possible as for (i) above.

(iii) Treatment of dry seed for the control of fungi, bacteria and viruses on the *outside* of the seed coat: Stir the seed into a solution of 1% trisodium phosphate (10 g per litre of water) and soak for 15 minutes. Strain off the solution and then soak the seed in 1% sodium hypochlorite for 40 minutes. Wash several times and dry as quickly as possible as for (i) above.

Commercial bleaching solutions contain sodium hypochlorite. If a bleaching solution with 3.5% sodium hypochlorite is used, then 100 mls of the commercial product is mixed with 250 mls of water to give 350 mls of 1% sodium hypochlorite.

(iv) Treatment of dry seed to control mosaic: Seed is stirred into a 10% solution of trisodium phosphate and allowed to soak for ten minutes. The seed is washed and dried as above in (i).

(v) Treatment of seed to control fungi and bacteria both *inside* and *outside* the seed coat.

Tie seed loosely in cheesecloth and immerse the seed in warm water at 55°C for 25 minutes. The seed bundle must be worked around so as to displace air bubbles and obtain wetting of all the seed as soon as possible. The seed is immediately plunged into cold water at the end of the heating period and is then dried as for (i) above. Seed should be planted soon after treatment.

(vi) Seed treatment with thiram or captan to protect seed in seedbed.

This treatment should be applied to all tomato seed prior to planting. The fungicide is mixed with seed, 2-3 g per 100 g seed, by shaking the two together for several minutes in a suitable container.

Seed-bed treatments

Seed-bed sprays

For preventive purposes prior to any disease appearing foliage spray should be applied at half the rate recommended for field application. Those listed under target spot (p. 356) are most suitable. If bacterial spot is likely to occur then the corresponding fungicide should be used, also at half the field rate.

Seed-bed fungicidal drench

The fungi which cause damping-off fall into two groups, the water moulds, e.g., *Pythium* spp. and *Phytophthora* spp., and others e.g., *Rhizoctonia* spp., and *Fusarium* spp. Different fungicides are required to control each group. Thiram 80% (1.5 g/litre) or fenaminosulf 70% (1 g/litre) is recommended for its action against the water moulds. Quintozene 75% (5 g/litre) is recommended to control the second group of fungi. Often it is necessary to apply a combination of two fungicides, one from each group. The fungicidal drench must be constantly stirred and applied to the seedbed at the rate of approximately 5 l/m². There are several other fungicides which are promising for this purpose. Growers should enquire of extension officers to find out when these compounds become available and are registered for use on tomatoes.

Fungicides for field use

For *Target spot, Irish blight and Septoria leaf spot* (as a foliage and fruit spray)

chlorothalonil (75%)	..	1.5-2 kg/1 000 litres (1½-2 lb/100 gals)
copper oxychloride (50%)	..	5 kg/1 000 litres (5 lb/100 gals)
cuprous oxide (50%)	..	
mancozeb (80%)	..	1.5-2 kg/1 000 litres (1½-2 lb/100 gals)
maneb (80%)	..	
metiram (80%)	..	These fungicides are grouped under the heading "Dithiocarbamates"
propineb (70%)	..	
zineb (65-80%)	..	

Chlorothalonil and the dithiocarbamates are slightly more efficient than the copper compounds.

For *Grey leaf spot* (as a foliage and fruit spray)

chlorothalonil	..	} At same concentrations as for target spot.
mancozeb	..	
propineb	..	

For *Sclerotinia rot* (as a foliage and fruit spray)

benomyl (50%) .5 to 1 kg/1 000 l ($\frac{1}{2}$ -1 lb/100 gals)

For *Leaf mould* and *grey mould* (as a foliage and fruit spray)

benomyl 0.8 to 1 kg/1 000 l (0.8-1 lb/100 gals)

chlorothalonil 1.5 to 2 kg/1 000 l (1-2 lb/100 gals)

For *Sclerotium base rot* (as a drench)

quintozene (75%) 5 g/litre at the rate of 0.5 litres per seedling at time of planting out.

For *Bacterial spot* (as a foliage and fruit spray)

cuprous oxide 5 kg/1 000 litres (5 lb/100 gals)

Post-harvest treatment

For *Alternaria* fruit-rot the fruit is dipped in nabam at the concentration of 600 ml/100 litres ($\frac{3}{4}$ gal/50 gal). A wetting agent is required and the fruit should be completely submerged, removed without any waiting period and allowed to dry before packing.

Inactivator for control of virus

The present recommendation for control of tobacco mosaic virus on planting boxes, old posts, trellising wire and implements is to use a spray or dip of 10% trisodium phosphate. The chemical need not be washed off.

If there is any possibility of tobacco mosaic virus being present, when the grower is handling plants, hands should be dipped in 10% trisodium phosphate. The chemical is left on the hand so that the virus is inactivated immediately.

Brand Directories

NEW editions of the Horse and Cattle Brands Directory and Sheep Brands and Earmarks Directory are now available.

The price for the Horse and Cattle Brands Directory, compiled to 30th June 1971, is \$45. Due to steep increases in labour, printing and paper costs, it has not been possible to approve the sale of this directory at a lower price—this price is set almost at cost.

The Sheep Brands and Earmarks Directory, compiled to 31st December 1974 is priced at \$5.00.

All prices include postage.

Any person who wants to buy any of these Directories should forward the required amount and advise the relevant details to the Registrar of Brands, Department of Primary Industries, William Street, Brisbane, 4000.

Maize varietal planting guide 1976-77 season

Compiled by S. R. WALSH, Agriculture Branch.

MAIZE varieties recommended for planting in the 1976-77 season are listed on pages 383 to 385.

The varieties have not been ranked in order of preference. Those listed "for trial" should only be sown in limited areas to evaluate their performance.

Plant Populations

The planting rate will be governed by environment, soil moisture, soil type, planting time, and whether irrigated or raingrown; the rate should be varied according to the conditions. A 10% loss in field establishment can normally be expected.

Maize seed sold by the major seed companies is of high quality and is required to have a minimum laboratory germination of 90%.

Seed is available commercially in a range of shapes and sizes. Selection from this range can be made to suit the type of planting machinery being used.

The size usually ranges between 2 600 to 4 500 seeds per kg.

APPROXIMATE PLANTING RATE KILOGRAMS PER HECTARE FOR A GIVEN PLANT POPULATION

Plants/ha	Seed kg/ha			
	Seed Size (Seeds/kg)			
	2 500	3 000	3 500	4 000
15 000	6.5	5.5	4.75	4.0
20 000	9.0	7.5	6.0	5.5
30 000	13.0	11.0	9.5	8.0
50 000	22.0	18.5	15.8	14.0
60 000	26.0	22.0	19.0	16.5

Most commercial seed companies mark on the container the seed count per kilogram.

Disease

The main diseases affecting maize are leaf blight, head smut and maize dwarf mosaic.

Common Leaf Blight

The fungus *Drechslera turcica* produces grey or light-brown large spindle-shaped leaf spots commonly up to 15 x 2 cm in size. A description and colour plate of this disease appeared in the August 1974 edition of the *Queensland Agricultural Journal*. Late maturing varieties have effective blight resistance. These include the QK, PQ, and GH varieties. Early maturing varieties with moderate resistance to the disease are Q 739, XL 389, XL 81 and DK 805A.

Maydis Leaf Blight

The incidence of maydis leaf blight (*Drechslera maydis*) was extremely low throughout south Queensland during the 1975-76 season due to the almost exclusive use of seed with N cytoplasm. Race O of the pathogen, which attacks varieties with N cytoplasm, is restricted to North Queensland.

Head Smut

In North Queensland and certain areas of the South Burnett region, head smut caused by *Sphacelotheca reiliana* is prevalent. Grain yields may be seriously reduced in crops with a heavy infection because the grain is replaced by a mass of fungal spores.

Seed treatments may destroy externally borne spores on the seed but will not protect a crop against infection from smut in infected soil.

Varieties least susceptible to this disease are XL 81, XL 389, Q 692, Q 739, Q 1280 and GH 128, XL 99, XL 399.

Maize Dwarf Mosaic

This disease has been troublesome in many South Queensland maize crops during recent years. Maize dwarf mosaic is caused by infection with the Johnson grass strain of sugarcane mosaic virus which is transmitted by aphids.

Infected plants of susceptible hybrids show conspicuous stripes or mosaic and ringspot patterns. Severe stunting may result, particularly when plants are infected early. The virus is maintained between seasons in Johnson grass and stand-over fodder sorghum.

Disease control cannot be effectively achieved with insecticides and Johnson grass cannot be economically eradicated in all situations. Control of the disease is achieved by sowing resistant hybrids. Recommended hybrids with resistance to maize dwarf mosaic are listed below:—

HIGHLY RESISTANT—Q 692, Q 739, QK 217, QK 231, GH 128, Q 1280.

MODERATELY RESISTANT—GH 390, PQ 500, XL 306, XL 81, XL 389, XL 399.

Maturity

Varieties may vary in maturity depending on the environment in which they are sown.

The recommendations are basic information only and further details should be sought from your local Agricultural Extension Officer.

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Far Northern— Cook, Mareeba, Atherton, Eacham, Herberton, Mulgrave, Johnstone, Cardwell, Douglas, Etheridge	Dec.—mid Feb.	M: QK 217, QK 231, QK 487 (QK 487 for severe head smut areas)	35 000
Northern— Hinchinbrook, Dalrymple, Thurin- gowa, Ayr, Bowen, Proserpine	Mar.—July	<i>Irrigated—</i> MS: XL 389 M: XL 81 <i>For Trial</i> MS: XL 99, XL 399	60 000–70 000
Capricornia— Livingstone, Fitzroy, Calliope, Broadsound	Dec.—Jan.	S: Q 692, GH 128, Q1280 M: QP 500 MQ: Q 739	20 000–25 000
Banana, Duaringa	End Dec.—End Jan.	S: Q 692, Q 1280, GH 128, GH 390 MS: XL 389 M: XL 81 MQ: Q 739	20 000–30 000
Burnett— Miriam Vale, Kolan, Gooburrum, Woongarra, Isis, Perry, Part Biggenden, Hervey Bay, Part Tiaro, Woocoo	Late Aug.—Early Jan.	S: Q 1280, GH 128, GH 390, GH 134 MS: XL 389 M: DK 805A, XL 81	20 000–25 000

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Burnett—continued Gayndah, Mundubbera, part Biggenden	Mid Nov.—Early Jan.	S: Q 1280, GH 128, GH 390 MS: XL 389 M: XL 81 MQ: Q 739 <i>For Trial</i> MS: XL 99, XL 399	18 000–25 000
Monto, Eidsvold	Mid Nov.—Early Jan.	S: Q 1280, GH 128, GH 390 MS: XL 389 M: XL 81 MQ: Q 739 <i>For Trial</i> MS: XL 99, XL 399	18 000–25 000
South Burnett— Kingaroy, Nanango, Wondai, Murgon, part Kilkivan, part Rosalie	Mid Nov.—Mid Dec.	S: Q 1280, GH 128 MS: XL 99, XL 399 M: XL 81 MQ: Q 739	S—22 000–30 000 M—27 000–30 000
Near North Coast— Widgee, Noosa, part Tiaro, Maroochy, Landsborough	Nov.—Jan.	S: XL 389, GH 390 M: XL 81	IRRIGATED 50 000 RAINGROWN 30 000
East Moreton— Caboolture, Pine Rivers, Redlands, Albert, Beaudesert	Sept.—Dec.	S: Q 692, Q 1280, GH 128, GH 390 MS: XL 389 M: PQ 500, XL 81 MQ: Q 739	RAINGROWN 25 000–30 000 IRRIGATED 50 000
West Moreton— Moreton, Esk, Kilcoy, Boonah, Gatton, Laidley	Sept.—Dec.	S: Q 692, Q 1280, GH 128, GH 390 MS: XL 389 M: PQ 500, XL 81 MQ: Q 739	RAINGROWN 25 000–30 000 IRRIGATED 50 000
Darling Downs— Wambo, Chinchilla	Sept.—Nov.	S: Q 692 M: XL 81, PQ 500 MQ: Q 739, XT 664 Q: XL 306 <i>For Trial</i> MS: XL 99, XL 399	15 000–25 000
	Oct.—Dec.	M: XL 81, PQ 500 MQ: Q 739, XT 664 Q: XL 306	15 000–25 000
Pittsworth, Millmerran (East of Condamine River), Jondaryan, Crows Nest, part Rosalie	Oct.—Dec.	MS: XL 389 M: XL 81, PQ 500 MQ: Q 739, XT 664 Q: XL 306 <i>For Trial</i> MS: XL 99, XL 399	20 000–30 000

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Darling Downs—continued Millmerran (West of Condamine River)	Oct.–Dec.	S: Q 692 M: XL 81, PQ 500 MQ: Q 739, XT 664 Q: XL 306 <i>For Trial</i> MS: XL 99, XL 399	
Clifton, Allora, Cambooya, Rosenthal, Glengallan	Oct.–Dec.	MS: XL 389 M: XL 81, PQ 500 MQ: Q 739 Q: XL 306 <i>For Trial</i> MS: XL 99, XL 399	20 000–25 000
Stanthorpe	Nov.–Dec.	M: DK 805A	20 000–30 000 <i>Heavier rate Eastern Section</i>
All Shires	Oct.–Dec.	<i>Irrigated—</i> S: Q 692 MS: XL 389 M: XL 81, PQ 500 MQ: Q 739 <i>For Trial</i> MS: XL 99, XL 399	50 000–60 000
Near South West— Balonne	Oct.–Dec.	<i>Irrigated only—</i> MS: XL 389 M: XL 81 <i>For Trial</i> MS: XL 99, XL 399	50 000–60 000

For further information on varietal performance in your district, consult your Agricultural Extension Officer.

S = Slow Maturity; MS = Medium Slow Maturity; M = Medium Maturity; MQ = Medium Quick Maturity; Q = Quick Maturity

Soybean Varieties

1976-77 season

Compiled by S. R. WALSH, Agriculture Branch.

SOYBEAN varieties recommended for planting in Queensland in the 1976-77 season are listed below.

December is the main planting time, but under some situations this period maybe extended from November to January. The crop has critical requirements for cultivation, nutrition, moisture, weed and insect control.

Plant maturity is decreased by shortening daylength and the planting rate should be increased with the later plantings.

The planting rates refer to a desirable plant stand; the lighter rates for early sowing and the heavier rates for late sowing.

Late January plantings in West Moreton should be avoided, because of the possibility of rust developing and causing severe losses.

Although Semstar is recommended in certain situations, it is highly susceptible to bacterial pustule and wild fire; this may cause a reduction in yield.

Two new soybean varieties, Collee and Flegler, were recently released by the Department of Primary Industries.

Collee

This variety was selected at the Hermitage Research Station from a cross of Hill x Lee made in 1965.

Collee is early maturing and will flower one to two days earlier than Hill. It has a determinate growth habit with purple flowers and tawny pubescence. The shiny yellow seeds have black hila.

Collee is resistant to shattering, lodging, bacterial pustule and to wild fire. It has a higher protein content and slightly lower oil content than Hill.

Limited seed supplies will be available for sowing this season.

Flegler

Flegler was selected at the Hermitage Research Station in 1970 from a natural cross in the variety Patterson.

It has a determinate growth habit with purple flowers and tawny pubescence. Flegler flowers two to three days later than Bragg. The seeds are yellow with a black hila.

It is resistant to bacterial pustule, wild fire and to shattering.

No seed of Flegler will be commercially available for the 1976-77 season.

Soybean Varieties for 1976-77 Season

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Far Northern— Cook, Mareeba, Atherton, Eacham, Herberton, Mulgrave, Johnstone, Cardwell, Douglas	Dec.—mid Jan.	Ross	300 000
Northern— Hinchinbrook, Dalrymple, Thuringowa	Dec.—mid Jan.	Ross	300 000
Ayr, Bowen, Proserpine	Dec.—mid Jan.	<i>Irrigated</i> Gilbert, Ross	250 000–300 000

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Capricornia— Livingstone, Fitzroy, Calliope, Broadsound	Dec.—early Jan.	Davis	250 000–300 000
Emerald, Peak Downs, Belyando	Mid Dec. Mid Jan. Mid Jan.—mid Feb.	Daintree Wills, Davis Davis	200 000–250 000 300 000–375 000 375 000–500 000
Banana, Duaringa	Dec.	<i>Irrigated</i> Davis, Bragg, Hampton, Wills	250 000–300 000
	Early—mid Jan.	Davis	350 000
	Dec. Early—mid Jan.	<i>Raingrown</i> Davis, Bragg, Wills Davis	200 000–250 000 300 000
Burnett— Miriam Vale, Kolan, Gooburrum, Woongarra, Isis, Perry, Biggenden, Hervey Bay, part Tiaro, Woocoo	Dec.—early Jan.	Bragg, Davis, Wills	250 000–300 000
Gayndah, Mundubbera	Dec.—early Jan.	Bragg, Davis, Wills	250 000–300 000
Monto, Eidsvold	Dec.—early Jan.	Bragg, Davis, Wills	250 000–300 000
South Burnett— Kingaroy, Nanango, Wondai, Murgon, part Kilkivan, part Rosalie	Late Nov.—early Jan.	Bragg, Davis, Semstar <i>For Trial</i> Collee	250 000–300 000
Near North Coast— Widgee, Noosa, part Tiaro, Maroochy, Landsborough	Mid Nov.—mid Jan.	Bragg, Davis, Wills	250 000–300 000
East Moreton— Caboolture, Pine Rivers, Redlands, Albert	Mid Nov.—mid Jan.	Davis, Bragg, Wills	250 000–300 000
West Moreton— Moreton, Esk, Kilcoy, Boonah, Gatton, Laidley, Beaudesert	Dec.—early Jan.	<i>Irrigated</i> Davis, Bragg, Hampton, Wills	300 000–400 000
		<i>For Trial</i> Collee	
	Nov.—early Jan.	<i>Raingrown</i> Bragg, Davis, Wills	250 000–300 000
	Nov.	Hill	300 000–350 000
		<i>For Trial</i> Collee	300 000–350 000
	Late Jan.	Davis	350 000–400 000
Darling Downs— Wambo, Chinchilla	Nov.—Dec.	<i>Irrigated</i> Davis, Bragg, Hampton, Hill, Collee	300 000–400 000
		<i>Raingrown</i> Semstar	150 000–200 000

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Darling Downs—continued			
Pittsworth, Millmerran, Jondaryan, Crows Nest, part Rosalie, Cambooya	Nov.—Dec.	<i>Irrigated</i> Davis, Bragg, Hampton, Hill, Collee	300 000—400 000
	Early Jan.	Davis	250 000—300 000
	Nov.—Dec.	<i>Raingrown</i> Hill, Semstar	200 000—300 000
Clifton, Allora, Rosenthal, Glengallan	Nov.—Dec.	<i>Irrigated</i> Davis, Bragg, Wills, Collee	300 000—400 000
	Nov.—Dec.	<i>Raingrown</i> Hill, Davis, Bragg, Collee	200 000—300 000
	Early Jan.	Hill, Davis	250 000—300 000
Stanthorpe	Nov.—Dec.	Hill, Collee	300 000—350 000
Inglewood	Late Nov.—Dec.	<i>Irrigated</i> Bragg, Wills, Hill	300 000—350 000
	Early Jan.	<i>For Trial</i> Collee Hill	300 000—400 000
		<i>Raingrown</i> Not recommended	
Near South West— Balonne	Nov.—early Jan.	<i>Irrigated</i> Wills, Davis	300 000—400 000
		<i>For Trial</i> Collee	
		<i>Raingrown</i> Not recommended	

For further information on varietal performance in your district consult your Agricultural Extension Officer.

DO not burn containers which have held weedkillers such as 2,4-D and its derivatives. When these herbicides volatilize, the resulting vapour may damage nearby plants, crops and shrubbery. Also, herbicides or defoliant containing chlorates may explode when heated.

Dispose of these containers in this manner:

- Break glass containers and chop holes in the top, bottom and sides of metal containers so they cannot be re-used or collect water. A sharpened pickaxe is best for this purpose.
- Bury all weedkiller containers to a depth of 18 inches at a safe disposal site or take them to a dump where they will be covered with soil.

By courtesy Agricultural and Veterinary Chemicals Association.

Grain Sorghum Planting Guide 1976-77 season

by Officers of Agriculture and Plant Pathology Branches, Department of Primary Industries.

GRAIN sorghum varieties recommended for planting in Queensland in the 1976-77 season are listed on pages 390 to 395.

In the tables the varieties have not been ranked in order of preference.

The varieties listed "for trial" should be sown in smaller areas for evaluation under your conditions. It would be appreciated if farmers would advise their Agricultural Extension Officer of trial plantings as this will enable a wider evaluation of the performance of these hybrids to be made.

Some hybrids appear to be closely related and are therefore interchangeable, for example Texas 626 and NK 212, and Goldfinger and NK 233.

The hybrid, Pioneer 846, and the open pollinated variety Alpha show a marked reaction to the insecticide monocrotophos.

Open-headed varieties are desirable in the more humid regions.

Planting rates

The planting rates refer to desirable established plant stands, and will be varied according to available soil moisture, time of planting and soil type. Your Agricultural Extension Officer will provide further information on planting rates.

Grain sorghum seed sold by major seed companies is of high quality and is required to have a laboratory germination of 80% or higher.

Seed size varies with hybrids but is generally in a range of 20 000 to 35 000 seeds per kilogram; seed of Alpha is much smaller and generally ranges from 45 000 to 65 000 seeds per kilogram.

APPROXIMATE PLANTING RATE FOR GIVEN PLANT POPULATIONS

Plants/ha	Planting Rate kg/ha
50 000 ..	2.5
75 000 ..	3.75
100 000 ..	5.0
150 000 ..	7.5

Adjustments must be made for higher or lower populations and smaller seed size, e.g. Alpha. The efficiency of planting machinery is also variable.

Lodging

Lodging is a major problem in many grain sorghum producing areas in Queensland. The most prevalent type of lodging in Queensland is that which follows moisture stress during the grain filling period. Under such conditions all known grain sorghum hybrids and varieties will lodge. Lodging can also be associated with conditions other than moisture stress and hybrids relatively resistant to one form of lodging may be more susceptible to other forms.

Nevertheless, trial data and farmer experience have enabled classification of the hybrids as to their lodging resistance.

Because of the importance of lodging only lodging resistant hybrids are recommended for areas where lodging is known to be a problem. Other hybrid characteristics, particularly grain yield, determine the recommendations for areas where lodging is usually not important.

Lodging is not usually of importance in fully irrigated crops but can occur in well grown irrigated crops which experience moisture stress during grain filling.

Crop maturity

In the guide the varieties have been given maturity ratings. However hybrid sorghum maturity is governed largely by temperature and to a lesser extent by day lengths. Varieties when sown in October in south Queensland would flower in 60 to 65 days but, the same varieties, could be expected to flower in a much shorter period, 50 to 55 days, when sown in December.

The slow and medium-slow varieties may therefore react as mid-season types when sown later in the season.

Head smut

Head smut is an important soil borne disease favoured by cool soil conditions. It is common in early plantings in south Queensland.

A 12% head smut incidence, which is common on highly susceptible varieties, represents a 12% yield loss.

Avoid sowing highly susceptible (HS) varieties early in areas where this disease is known to have occurred.

Sugar Cane Mosaic Virus (SCMV)

All grain sorghum varieties grown in Queensland are susceptible to the Johnson grass strain of sugar cane mosaic virus.

Three types of symptoms occur; these depend on varieties and environmental conditions.

The mosaic (M) symptom is shown by most of the recommended hybrids.

Under field conditions the grain yield of mosaic reactors is little affected.

Red stripe (R.S.) reactors—Dorado E and Pacific 303 show a conspicuous red striping when infected. Early infection results in severe stunting and consequently a substantial yield loss.

There are two red leaf (RL) reactors, Q5161 and Sunlover I. When cool conditions follow infection the mosaic symptoms change to red spots, streaks and areas of dead tissue; this is the red leaf symptom.

If severe red leaf disease occurs, substantial yield loss will result.

Rust

Sorghum rust occurs in most districts throughout the State; it is more prevalent in late sown crops.

Severe rust infection in highly susceptible (HS) varieties has been associated with pinched grain and yield reduction. Premature plant death may also occur predisposing the plant to lodging.

Grain Sorghum Planting Guide-1976-77

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Far Northern— Cook, Mareeba, Atherton, Eacham, Herberton, Mulgrave, Johnstone, Cardwell, Douglas, Etheridge	Dec.—Mid Feb.	S: NK 300F MS: E 57 MQ: Goldfinger, NK 233 <i>For Trial</i> S: Tropic MS: Dorado	75 000–100 000
Northern— Hinchinbrook, Dalrymple, Thuringowa, Ayr, Bowen, Proserpine	Mar.—July	<i>Irrigated</i> MS: E 57, Texas 671, E 55e, NK 275, Golden Acres Tell <i>For Trial</i> S: F 64a, Tropic, Pacific 303, NK 300F	250 000

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Northern—continued	Dec.—Mar.	<i>Raingrown</i> MS: E 57, Alpha MQ: Goldfinger, NK 233 <i>For Trial</i> S: Pacific 303	75 000
Capricornia— Livingstone, Fitzroy, Calliope, Broadsound	Late Dec.—Feb.	MS: E 57, Alpha, Dorado MQ: Goldrush <i>For Trial</i> S: F 64a	75 000
Nebo	Mid Dec.—Mid Jan.	MS: E 57, Q 5161, Sunlover I <i>For Trial</i> S: F 64a MQ: Goldrush	75 000
Emerald, Peak Downs, Belyando, Bauhinia	Sept.—Oct.	<i>Irrigated</i> MS: E 57, Texas 671, E 55e, NK 266, NK 275, Golden Acres Tell M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233 <i>For Trial</i> S: F 64a, Pacific 303, Tropic	80 000–120 000
	Mid Dec.—Mid Jan.	<i>Raingrown</i> MS: E 57, Q 5161, Sunlover I <i>For Trial</i> MS: F 64a MQ: Goldrush	75 000
Banana, Duaringa	Mid Dec.—End Jan.	<i>Irrigated</i> S: F 64a MS: E 57, E 55e, Texas 671, NK 266, NK 275, Golden Acres Tell M: Pioneer 846, Texas 610 SR, NK 212, Texas 626, Grain- master A MQ: Goldfinger, NK 233	250 000
	Late Dec.—Early Feb.	<i>Raingrown</i> MS: E 57, Q 5161, Sunlover I <i>For Trial</i> S: F 64a MQ: Goldrush	75 000
Burnett— Miriam Vale, Kolan, Gooburrum, Woongarra, Isis, Perry, part Biggenden, part Tiaro, Woocoo, Hervey Bay	Sep.—Jan.	S: F 64a MS: E 57, NK 266 <i>For Trial</i> MS: Dorado MQ: Goldrush	75 000
Monto, Eidsvold	Nov.—Jan.	S: F 64a MS: E 57, Q 5161, NK 266, Sun- lover I M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233 <i>For Trial</i> MS: Dorado, Leader (PM 2) MQ: Goldrush, Dorado E.	75 000
Gayndah, Mundubbera, part Biggenden	Nov.—Jan.	S: F 64a MS: E 57, Q 5161, NK 266, Sun- lover I M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: NK 233, Goldfinger <i>For Trial</i> MS: Dorado, Leader (PM 2) MQ: Goldrush, Dorado E	75 000

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
South Burnett— Kingaroy, Nanango, Wondai, Murgon, part Kilkivan, part Rosalie (Dark alluvial soils all districts)	Mid Nov.–Dec.	MS: NK 266, Dorado, Golden Acres Y 101 M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233 <i>For Trial</i> S: F 64a MS: E 55e, NK 266, NK 275, Golden Acres Tell, Leader (PM 2) M: Pride (PM 1)	100 000
Other soils all districts	Mid Nov.–Dec.	MS: E 57, Q 5161, Sunlover I <i>For Trial</i> S: F 64a MS: Leader, (PM 2) M: Pride (PM 1) MQ: Goldrush, Dorado E	75 000–100 000
Near North Coast— Widgee, Noosa, part Tiaro, Maroochy, Landsborough	Mid Nov.–End Jan.	MS: E 57 MQ: Goldfinger, NK 233	75 000
East Moreton— Caboolture, Pine Rivers, Red- lands, Albert, Beaudesert	Sept.–Mid Jan.	<i>Irrigated and Raingrown</i> MS: E 57, Dorado M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233, Dorado E	<i>Irrigated</i> 250 000 <i>Raingrown</i> 100 000
West Moreton— Moreton, Esk, Kilcoy, Boonah, Gatton, Laidley	Sept.–Mid Jan.	<i>Irrigated and Raingrown</i> MS: E 57, Dorado, Q 5161, Sun- lover I M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233, Dorado E	<i>Irrigated</i> 250 000 <i>Raingrown</i> 100 000
Darling Downs— Wambo, Chinchilla	Oct.–Mid Jan.	MS: E 57, Dorado, NK 266, Q 5161, Sunlover I, Golden Acres Y 101 M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233, Dorado E <i>For Trial</i> M: Pride (PM 1) MQ: Goldrush	Jimbour Plain 100 000 Other Areas 50 000
Pittsworth, Millmerran (east of Condamine River), Jondaryan, Crows Nest, part Rosalie	Oct.–Nov.	MS: NK 266, Dorado, Golden Acres Y 101 M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233, Dorado E <i>For Trial</i> M: Pride (PM 1)	100 000
Millmerran (Brigalow soils)	Oct.–Nov.	MS: E 57, NK 266, Dorado Golden Acres Y 101, Q 5161, Sunlover I M: Texas 610 SR, NK 212, Texas 626, Grainmaster A, C 42 T MQ: Goldfinger, NK 233 <i>For Trial</i> MS: Leader (PM 2) M: Pride (PM 1) MQ: Goldrush, Dorado E	75 000

REGION AND SHIRES	PLANTING TIME	VARIETIES	PLANTING RATE PLANTS/HECTARE
Darling Downs—continued Clifton, Allora, Rosenthal, Glen- gallan, Cambooya	Oct.—Mid Dec.	MS: E 57, NK 266 M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233 <i>For Trial</i> MS: Leader (PM 2) M: Pride (PM 1) MQ: Dorado E	75 000
Stanthorpe	Nov.—Mid Dec.	MS: E 57, Q 5161, Sunlover I, Golden Acres Y 101, Dorado <i>For Trial</i> MQ: Goldrush, Pride (PM 1)	75 000
Inglewood	Sept.—Oct.	MS: E 57, Q 5161, Sunlover I <i>For Trial</i> S: F 64a MQ: Goldrush	75 000
All districts	Sept.—Oct.	<i>Irrigated</i> MS: Texas 671, E 55e, NK 275, NK 266, Golden Acres Tell, Dorado, Golden Acres Y 101 M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233, Dorado E <i>For Trial</i> S: F 64a	250 000
Near South West— Waggamba	Sept.—Oct.	MS: E 57, Q 5161, Sunlover I M: Texas 610 SR, NK 212, Texas 626, Grainmaster A MQ: Goldfinger, NK 233 <i>For Trial</i> MQ: Goldrush, Dorado E	75 000
Balonne	Dec.—Jan.	<i>Irrigated only</i> S: F 64a MS: NK 275, Texas 671, Dorado, E 55e, Golden Acres Y 101, Golden Acres Tell M: Texas 610 SR, NK 212, Texas 626, Grainmaster A	250 000
Murilla, Tara, Taroom	Late Sept.—Oct. and Late Dec.—Jan.	MS: E 57, Q 5161, Sunlover I <i>For Trial</i> S: F 64a MQ: Goldrush	50 000–75 000
	Feb.	Q: Pacific 001 <i>For Trial</i> M: C 42 T MQ: Goldrush, Dorado E	50 000–75 000
Bungil, Bendemere, Warroo, Booringa	Late Dec.—Jan.	MS: E 57, Dorado, Q 5161, Sun- lover I, Golden Acres Y 101 <i>For Trial</i> MQ: Goldrush, Dorado E	50 000–75 000

S = Slow maturity; MS = Medium Slow maturity.

M = Medium maturity; MQ = Medium Quick maturity.

Q = Quick maturity.

For further information on varietal performance in your own district consult your Agricultural Extension Officer.

Guide to Grain Sorghum Hybrid Characteristics

by R. G. HENZELL, Senior Plant Breeder, P. E. MAYERS, Plant Pathologist & O. W. DUNCAN, Executive Officer, Queensland Graingrowers Association

SEED COMPANY	HYBRID	TIME OF FLOWERING	HEAD SMUT	SUGARCANE MOSAIC VIRUS REACTION	RUST	LODGING	HEIGHT	HEAD	GRAIN COLOUR
Yates	NK 147 ..	Q	R	M	HS*	Below Average	MS	Semi-compact	Red
	NK 233 ..	MQ	R	M	S	Average	M	Semi-compact	Bronze
	NK 220Y ..	M	R	RS	S*	Average	MS	Semi-open	Bronze
	NK 207 ..	M	HS	M	S*	Average	MS	Semi-compact	Red
	NK 212 ..	M	R	M	R	Average	M	Compact	Red
	NK 266 ..	MS	R	M	S	Average	MT	Semi-open	Bronze
	NK 300F ..	S	R	M	..	Below Average*	VT	Semi-compact	Brown
	NK 275 ..	MS	R	M	S	Average	M	Compact	Red
Pacific	007	Q	S	M	S	Below Average	MT	Semi-compact	Red
	001	Q	S	M	HS	Average	S	Semi-open	Red
	Goldfinger ..	MQ	R	M	S	Average	M	Semi-open	Bronze
	Goldrush ..	MQ	S	M	HR	Good*	M	Semi-open	Red
	222	M	R	RS	..	Average	MS	Semi-open	Bronze
	303	S	R	RS	R	..	T	Semi-compact	Red
	Tropic	S	R	M	..	Average*	T	Open	Bronze
	Pacific 710 ..	M	R	M	R	Average	M	Compact	Red
Asgrow	Dorado E ..	MQ	R	RS	R	Above Average	MS	Semi-compact	Bronze
	Dorado A ..	M	R	M	S	Below Average*	M	Semi-open	Bronze
	Rico	M	R	M	S	Above Average*	M	Compact	Red
	Dorado ..	MS	R	M	R	Above Average	MS	Open	Bronze
Golden Acres ..	Grainmaster A	M	R	M	S	Average	M	Compact	Red
	Y 101 ..	MS	R	M	R	Above Average	MS	Open	Bronze
	TELL ..	MS	R	M	S*	Average	MT	Compact	Red
Panorama ..	Texas 610 S.R.	M	R	M	S	Average	M	Compact	Red
	Q 5161 ..	MS	HS	RL	R	Good	M	Compact	Bronze
Hylan	Texas 610 S.R.	M	R	M	S	Average	M	Compact	Red
	Q 5161 ..	MS	HS	RL	R	Good	M	Compact	Bronze
	Texas 671 ..	MS	R	M	R*	Average	MT	Compact	Red
	Texas 626 ..	M	R	M	S	Average	M	Compact	Red
	Alpha	MS	S	M	S	Good	MS	Semi-compact	Red

De Kalb ..	B17 ..	Q	HS	M	HS	Below Average	M	Semi-open	Brown-Red
	C 42T ..	M	R	M	HS	Above Average	M	Semi-compact	Bronze
	E 55e ..	MS	R	M	R	Above Average*	M	Semi-compact	Red
	E 57 ..	MS	HS	M	R	Good	M	Open	Bronze
	F 64a ..	S	R	M	R	Good	T	Open	Bronze
	FS 1a ..	Q	R	M	..	Below Average*	VT	Compact	Red
Pioneer ..	Pride (PM 1)	M	R	M	R	Above Average	MS	Semi-compact	Bronze
	Leader (PM 2)	MS	HS	M	R	Above Average	MS	Open	Bronze
	Big Red	S	S*	M	R*	..	M	Semi-compact	Red
	Pioneer 846 ..	MS	R	M	HS	Average	M	Semi-compact	Red
	Texas 610 S.R.	M	R	M	S	Average	M	Compact	Red
	Texas 626 ..	M	R	M	S	Average	M	Compact	Red
	Q 5161 ..	MS	HS	RL	R	Good	M	Compact	Bronze
	Sunlover I ..	MS	HS	RL	R	Good	MS	Semi-compact	Bronze
	Quicksilver ..	Q	HS	M	..	Below Average	S	Open	Red
Selected Seeds ..	Q 5161 ..	MS	HS	RL	R	Good	M	Compact	Bronze

KEY:—

Time to Flowering:—Q: Quick; MQ: Medium-Quick; M: Medium; MS: Medium-Slow; S: Slow.

Lodging behaviour ratings:—Good, above average, average, below average.

Height:—VT: Very Tall; T: Tall; MT: Medium-Tall; M: Medium; MS: Medium Short; S: Short.

Head:—Open, semi-open, semi-compact, compact. Compact heads dry less rapidly and are more susceptible to head caterpillars.

Head Smut:—R: Resistant; S: Susceptible; HS: Highly susceptible.

Leaf Rust:—HS: Highly susceptible; S: Susceptible; R: Resistant; HR: Highly Resistant. These classes are relative to each other, the dividing line being somewhat arbitrary.

Sugarcane Mosaic Virus Reaction:—M: Mosaic; RS: Red stripe; RL: Red leaf.

* Based on less than two year's data.

Brucellosis-Tested Swine Herds (As at 21 February, 1975)

BERKSHIRE

Clarke, E. J. & Son, "Kaloon Stud", Boonah
 Cochrane, S., "Stanroy", Felton
 Crawley, R. H., Rockthorpe, Linthorpe
 H. M. State Farm, Numinbah
 H. M. State Farm, Palen Creek
 Handley, Est. J. L., "Meadow Vale", Lockyer
 Handley, G. R., "Locklyn" Stud, Lockyer
 Kimber, E. R., Tarella, M.S. 805, Mundubbera
 Ludwig, A. L., "Beau View" Stud, Cryna, via Beaudesert
 Neuendorf, W., M.S. 794, Kalbar
 Queensland Agricultural College, Lawes
 Research Station, Hermitage
 Rosenblatt, G., Rosevilla, Biloela
 Westbrook Training Centre, Westbrook

LARGE WHITE

Ballon, E. E. & E. MacLagan
 Barrier Reef Islands Pty. Ltd., Hayman Island
 Batterham, P. & N., Raby Park, Inglewood
 Beutel, G. R. and Son, Brookdale Stud, M.S. 786, Boonah
 Bool, R. A. and B. E., Rossvale, Crow's Nest
 Briskey, R. G. and M. J., Wallingford, Pittsworth
 Brosnan, D. J., "Betafield", Mt. Murchison, via Biloela
 Cauley, J. R., M.S. 918, Toowoomba
 Cauley, T. P., M.S. Jondaryan 444, Rosalie
 Clegg, J. A. & M. A., "Karoma" Stud, Mundubbera
 Coleman, C. J., Merriland Stud, Britannia Station, Charters Towers
 Corney, F. D. and E. C. W., Pagel, Tara
 Cotter, N. J., "Olaroy", Goomeri
 Craig, K. F., "Echoes", Bancroft, via Monto
 Crawford, B. P. & B. J., M.S. 757, Kingaroy
 Department of Aboriginal and Island Affairs, Cherbourg
 Diete, E., Ingoldsby, 4343
 Duckett, R. and L. M., Fairview, Capella
 Duncan, C. P., "Colley", Flagstone Creek, Helidon
 Duncan, J. A. & B. L., Ma Ma Creek
 Dunlop Meats Pty. Ltd., Coondulla, Robertson Pk., Murray Upper
 Eagle, D. R. & J. A., "Walugra", 134 Hogg St., Toowoomba
 Fisher, J. & L., Lyndhurst, Jimbour
 Flegler, T. C., Wongabeena, Dalby
 Fletcher, L., "Par-en-eri" Stud, M.S. 806, Mundubbera
 Forster, I. S. & D. E., 112 Drayton Rd., Toowoomba
 Fowler, K. J. & B. D., "Kenstan", M.S. 195, Pittsworth
 Fowler, K. P., Northlea Stud Farm, 156 Hogg St., Wilsonton, T'ba
 Franke, K. H. and B., "Delvue" Stud, Cawdor
 Freeman, W. A., "Treviac", Rosewood
 French, A., "Wilston Park", Pittsworth
 Gosdon, T. C. & E. A., "Naumai", Dalby
 Graham, T., Dunleigh, Highfields
 Grayson, D. G., Wodalla, Killarney
 Harwood, L. B., Cobar, Tara
 H. M. State Farm, Numinbah
 Head, G. A., M.S. 825, Ipswich
 Hinchcliffe, D. F. & R. K., "Oakview", Milman, 4702
 Hockings, J. & M., "Quambi", Kubarilla
 Hudson, R. F. & V. D., "Rondel", Hogg St., Wilsonton, Toowoomba
 Jones, K. B. & I. R., "Cefn" Stud, Clifton
 Kajewski, C. & D. I., "Glenroy", Glencoe, via Toowoomba
 Kanowski, A., "Exton", Pechey
 Kimber, E. R., "Tarella", M.S. 805, Mundubbera
 Kruger, V. F. & B. L., "Greyhurst", Goombungee
 Kuhl, V. and C. A., "The Mounts", M.S. 222, Oakey
 Le Gros, W., "Elourea Stud", Marburg
 Little, R. S., P. M. & G. W., "Glengarry", Jimbour
 Maranoa Stud Piggery, Mitchell
 Marsden, M., "Fernflat", Canaga
 Mathieson, K. N., "Inderway", Gayndah
 Philip, R. J. and M. M., Boolarong Stud, Elimbah
 Postle, R. S., G. C. & Son, "Yarallaside" Stud, Pittsworth
 Queensland Agricultural College, Lawes
 Quilter, P. E., Paga Paga Piggeries, Postman's Ridge
 Radel, V. V., "Braedella" Stud, Coalstoun Lakes
 Robin, A. B., Blaxland Rd., Dalby
 Rosenblatt, G., Rosevilla, Biloela

LARGE WHITE—continued

Research Station, Biloela
 Ruge, A. F. & V. M., "Alvir" Stud, Biggenden
 Ruge, G. H. & I. E., "Al-Lester" Stud, Woowoonga, Biggenden
 Sharp, D. W. & L. J., "Arolla", Lavelle, Q., 4357
 Smyth, R., Barambah Rd., Goomeri
 Ward, R. J., "The Plateau", Mulgildie
 Whiteman, J. H. & A. B., Long's Bridge, via Warwick
 Willdo Farming Co., Southbrook
 Willet, L. J., "Wongalea", Irvingdale
 Williamson, K., Cattermul Ave., Kalkie
 Withcott Stud Piggery, Rowbotham St., Toowoomba
 Wolfenden, C. B. & J., Rossmoya

TAMWORTH

Kanowski, S. E., Pinelands, via Crows Nest

WESSEX SADDLEBACK

Douglas, Mrs. W. S. & Son, "Greylight" Stud Goombungee
 Smith, C. R. & Son, "Belton Park", Goombungee

LANDRACE

Ballon, E. E. & E., MacLagan
 Barrier Reef Islands Pty. Ltd., Hayman Island
 Batterham, P. & N., Raby Park, Inglewood
 Bertolotti, F. E. J. & N. I., "Mascotte", Wallumbilla
 Bool, R. A. and B. E., Rossvale, Crow's Nest
 Brosnan, D. J., "Betafield", Mt. Murchison, via Biloela
 Cauley, J. R., M.S. 918, Toowoomba
 Cauley, T. P., M.S. Jondaryan 444, Rosalie
 Clegg, J. A. & M. A., "Karoma" Stud, Mundubbera
 Coleman, C. J., Merriland Stud, Britannia Station, Charters Towers
 Crawford, B. P. & B. J., M.S. 757, Kingaroy
 Crowle, N. & D., Cooranga North, 4408
 Diete, E., Ingoldsby, 4343
 Duckett, R. and L. M., Fairview, Capella
 Dunlop Meats Pty. Ltd., Coondulla, Robertson Pk., Murray Upper
 Fisher, J. & L., Lyndhurst, Jimbour
 Flegler, T. C., Wongabeena, Dalby
 Fletcher, L., "Par-en-eri" Stud, M.S. 806, Mundubbera
 Forster, I. S. & D. E., 112 Drayton Rd., Toowoomba
 Fowler, K. J. & B. D., "Kenstan", M.S. 195, Pittsworth
 Fowler, K. P., "Northlea", 156 Hogg St., Wilsonton, Toowoomba
 Fowler, N. E. P. & M. P., c/- Kewpie Enterprises, Kingaroy
 Gosdon, T. C. & E. A., "Naumai", Dalby
 Graham, T., Dunleigh, Highfields, 4352
 Grayson, D. G., "Wodalla", Killarney
 Harwood, L. B., Cobar, Tara
 Hinchcliffe, D. F. & R. K., "Oakview", Milman, via Rockhampton
 Hockings, J. & M., "Quambi", Kubarilla
 Hudson, R. F. & V. D., "Rondel", Hogg St., Wilsonton, Toowoomba
 Jones, K. B. & I. R., "Cefn" Stud, Clifton
 Kajewski, C. & D. I., "Glenroy", Glencoe, via Toowoomba
 Little, R. S., P. M. & G. W., "Glengarry", Jimbour
 Maranoa Stud Piggery, Mitchell
 Marsden, M., "Fernflat", Canaga
 Marsh Pastoral Co., Brymaroo
 Nielsen, L. R., "Sunny Hill", Ascot, via Greenmount
 Peters, L. A., "Moonlight", Bongeen
 Philip, R. J. and M. M., Boolarong Stud, Elimbah
 Quilter, P. E., Paga Paga Piggeries, Postman's Ridge
 Radel, R. M., Trura Stud, Biggenden
 Robin, A. B., Blaxland Rd., Dalby
 Rosenblatt, G., Rosevilla, Biloela
 Ruge, A. F. & V. M., "Alvir", Biggenden
 Sharp, D. W. & L. J., "Arolla", Lavelle, Q., 4357
 Trotter, L. B. and L. J., "Caminda", Crawford, Kingaroy
 Whiteman, J. H. & A. B., Long's Bridge, via Warwick
 Willdo Farming Co., Southbrook
 Willet, L. J., "Wongalea", Irvingdale
 Williamson, K., Cattermul Ave., Kalkie

Chemical Weed Control Guide

Summer crops — 1976

J. E. RAWSON, J. M. T. MARLEY and S. R. WALSH
Agricultural Branch

THE following charts are a guide to the chemical control of weeds in summer crops.

Chemical weedkillers play a valuable part in weed control but for maximum effectiveness must be supported by sound cultural practices.

The same principles apply to weed control in summer crops as in winter crops that is, the choice of the most efficient chemical, timing of the spraying, rate and method of application and correct identification of the weed. Tolerance of summer crops to chemicals may vary with the stage of growth, therefore timing of spraying is important.

Some chemicals may be applied as either pre-emergence or post-emergence treatments, therefore care must be taken to follow the manufacturers' instructions printed on the label of the container.

Some subsequent crops may be affected by residues of a chemical applied to a previous crop. This must be considered in the choice of the chemical to be used.

When applying chemical weedkillers, producers should take care to avoid spray drift to adjacent crops that may be susceptible to these chemicals.

Because chemical costs change so frequently it has not been possible to give a cost per hectare of the various chemicals. Producers should check the prices before selecting chemicals from the chart; cost, efficiency and residual effects should be considered.

This guide is basic information only and further advice as related to your own farm needs should be obtained from your Agricultural Extension Officer. He will also know the current prices of the various chemicals.

Attached to this guide is a list of common weeds and some general notes on the use of weedkillers. This should be read in conjunction with the charts for individual crops.

WEED CONTROL GUIDE

SORGHUM

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE— Atrazine	Several products (80% wettable powder or 50% flowable)	Rates and method of application as on manufacturers' registered labels	Post-planting, pre-emergence or split application (pre- and post-emergence) as on the label	Most annual grasses and broad-leaved species. (Urochloa may not be completely controlled)	Refer to manufacturers' label for rates of application for different soil types. Under furrow irrigated conditions a light incorporation is desirable There is a risk of damage to susceptible crops such as soybeans, sunflowers, cotton, navybeans and peanuts planted in rotation. Double cropped winter cereals and oil seeds may also be damaged. Refer to manufacturers' labels
Propachlor	Ramrod 65	6.70 kg	At planting	Most annual grasses, including Urochloa, and some broad-leaved weeds	Incorporation is not desirable. No residual problems
POST-EMERGENCE— 2,4-D amine	Several 50% products	1 100 ml	Post-emergence when crop is 10 to 25 cm. high and secondary roots have developed	Most broad-leaved weeds	<i>Some crop injury may occur. Do not apply from misting machines and boomless jet nozzles as uneven spray application and consequent crop damage may result; drift hazard is also accentuated. Some hybrids or varieties are more susceptible to 2,4-D than others</i>

SORGHUM—continued

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
POST-EMERGENCE— continued Picloram + 2,4-D	Tordon 50D	1 400 ml	As for 2,4-D	Full season control of <i>Datura</i> spp. Most other broad-leaved weeds including annual ground cherry and mintweed are controlled	For uniformity of application and reduction of drift hazard best results with ground-operated boom sprays. DO NOT sow lucerne for 8 months, or sunflowers, soybeans, navybeans, cowpeas or cotton for 18 months after treatment. If row cultivated avoid "throwing in" soil
Atrazine	Several products	2.8-4.2 kg or 4 500-6 700 ml	Post-emergence when weeds are in the 3 leaf stage or less. The sorghum plants must be at least 3 leaf stage	Most annual broad-leaved weeds and some annual grasses. Some annual broad-leaved weeds including mintweed and black pigweed may be controlled at lower rates	Weeds should be sprayed as young as possible. Wetting agent should be used at the rate of one part of 50% to 60% product to 500 parts of spray mixture. For residual effects consult manufacturers' labels
Dicamba	Several 20% products	700-1 400 ml	Crop height to 30 cm, 10 to 25 days after emergence	<i>Amaranthus</i> spp., mintweed, nightshade	Refer to manufacturer's label

Weed Control Guide

MAIZE

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE— Atrazine	Several products	2.8 kg to 4.2 kg or 4 500–6 700 ml	Post-planting, pre-emergence	Most annual grasses and broad-leaved weeds. (Urochloa may not be completely controlled)	Refer to manufacturers' label for rates of application for different soil types. Under dry land or furrow-irrigated conditions, a light incorporation is desirable. There is a risk of damage to susceptible crops such as soybeans, sunflowers, cotton, navybeans and peanuts planted in the rotation. Double-cropped winter cereals and oil seeds may also be damaged. Refer to manufacturer's label. On the Atherton Tableland best results are obtained from split application 1.4 kg/ha pre-emergence followed by 1.4 kg/ha post-emergence 80% product; rates should be adjusted for 50% product
Propachlor	Ramrod 65	6.70 kg	At planting	Most annual grasses, including Urochloa, and some broad-leaved weeds	Incorporation is not desirable. No residual problems
POST-EMERGENCE— 2,4-D amine	Several 50% products	1 100 ml	Post-emergence when weeds are small and maize is approximately 10 to 30 cm. in height and the secondary roots have developed	Most broad-leaved weeds	Avoid drift to nearby susceptible crops

MAIZE—continued

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
POST-EMERGENCE— continued Picloram + 2,4-D	Tordon 50D	1 400 ml	As for 2,4-D	Full season control of <i>Datura</i> spp. Annual ground cherry and other broad-leaved weeds may also be controlled	For uniformity of application and reduction of drift hazard, best result when applied from ground-operated boom sprayers Avoid “throwing in” of soil during subsequent cultivations. Do not sow lucerne for at least 8 months, and sunflowers, soybeans, navybeans, cowpeas or cotton for 18 months after application
Atrazine	Several products	2.8-4.2 kg or 4 500-6 700 ml	Post-emergence. Weeds small up to 3 leaf stage	Most annual broad-leaved weeds and some annual grasses. <i>Urochloa</i> may not be completely controlled. Mintweed may be controlled at lower rates	Wetting agent should be used at the rate of 1 part of 50% to 60% product to 500 parts of spray mixture

Weed Control Guide

COTTON

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE—PRE-PLANTING INCORPORATED— Trifluralin	Treflan 40%	1 400 ml–2 800 ml	May be applied from a number of weeks before, to immediately before planting	Most annual grasses and some broad-leaved weeds. Bell-vine, bladder ketmia, sesbania, thornapple, mintweed, Bathurst burr and Noogoora burr are not controlled	Thorough incorporation is essential. Refer to manufacturer's label for incorporation methods and for rates required on different soil types
Nitralin	Planavin 75	1.50 kg–2.20 kg	As for Treflan ..	As for Treflan ..	Thorough incorporation is essential. Refer to manufacturer's label
Dinitramine	Cobex ..	4 200 ml	As for Treflan ..	Many annual grasses and broad-leaved weeds	Refer to manufacturer's label
PRE-EMERGENCE—POST-PLANTING— Prometryne	Gesagard 50	2.20 kg–4.50 kg	Post-planting	Some annual grasses and broad-leaved weeds. 4.50 kg/ha required to control bell-vine, mintweed and sesbania pea	Light rain or irrigation following application may improve results. Heavy rain following application at the high rate may cause crop damage
Diuron	Several 80% products	1.10 kg–2.20 kg	Post-planting	As for prometryne but not as effective against bell-vine	As for prometryne

COTTON—continued

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE—POST-PLANTING—continued Fluometuron	Cotoran 80 WP	1.50 kg-3.0 kg	Post-planting	Similar to diuron; 3 kg/ha required for sesbania pea	As for prometryne. Cotton injury may occur on light soils
POST-EMERGENCE— Diuron	Several 80% products	0.60 kg-1.10 kg	Apply as a directed spray after cotton is 15 cm tall	Some annual broad-leaved weeds if treated when weeds are less than 8 cm tall	Add one part of 50%-60% non-ionic wetting agent to 250 parts of spray mixture. Total application of diuron for season should not exceed 4.5 kg per hectare
Fluometuron	Cotoran 80 WP	0.80 kg-1.70 kg	As for diuron	As for diuron	As for diuron
Prometryne	Gesagard 50	1.10 kg-2.20 kg	As for diuron	As for diuron	As for diuron. (In the Callide district it is more likely to cause crop damage than diuron or fluometuron)
MSMA	Daconate 8 (80% W/V) Nocweed MSMA (50% W/V)	2 800 ml 4 300 ml	Apply as a directed spray after the cotton is 7.5 cm tall and before first bloom opens	Some annual grasses and broad-leaved weeds. Top kill of nutgrass and Johnson grass may be obtained. Bathurst burr and Noogoora burr seedlings also controlled	DO NOT apply after first bloom. The addition of wetting agent is not necessary

For specialised control—(Lay-by, spot spraying) and general weed control on headlands, refer to "Weed Control in Cotton"
W. H. Hazard. Queensland Agricultural Journal August 1973.

Weed Control Guide

PEANUTS

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-PLANTING—PRE-EMERGENCE— Vernolate	Vernam ..	3 000 ml	Pre-planting, must be soil incorporated	Most annual grasses and some broad-leaved weeds. (Including "wandering Jew")	Refer to label for incorporation details. Use only on red soils
Trifluralin	Treflan ..	1 400–2 100 ml	Pre-planting, soil incorporated	Most annual grasses. Some annual broad-leaved weeds	With winter cereals in a double crop situation there is a risk of crop damage from chemical residue. Barley is more tolerant than wheat, with oats the least tolerant. Must be incorporated in the soil. Refer to manufacturer's label for details
POST-PLANTING—PRE-EMERGENCE— Alachlor	Lasso 50%	4 500 ml	Apply immediately after sowing. Peanuts should be sown at least 5 cm deep	Some annual grasses and broad-leaved weeds	Soil surface should be dry to moist NOT wet. Incorporate immediately after planting. Avoid "throwing in" soil during inter-row cultivation. North Queensland only
2,4-D amine	Shirweed 50	4 500 ml	Apply at or immediately after planting	Many annual broad-leaf weeds and grasses, including thornapple, summer grass and Urochloa	DO NOT incorporate. May be applied as a band over the row. NOT recommended in North Queensland. Heavy rain after spraying can result in some crop damage

PEANUTS—continued

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
POST-PLANTING—POST-EMERGENCE— MCPB	Tropotox Nufarm metacide	1 400–2 800 ml	After crop seedlings have emerged but before crop flowers	Most annual broad-leaved weed seedlings	Not more than 1 400 ml at or after the crop flowers. Some symptoms of crop injury may appear
2,4-DB	Embutox Selectone	2 100 ml	As for MCPB ..	As for MCPB. Also controls spiny emex	
Dinoseb	Agrico Daturan Nufarm DNBP A.C.F.- Austral Shirweed-P	5 600–11 000 ml	Must be applied before weeds are 15–20 cm in height	Some annual broad-leaved weeds including <i>Datura</i> spp., bell-vine, wild gooseberry, mintweed	Desiccant type chemical. Follow manufacturers' instructions regarding spray volumes and safety of operator

Weed Control Guide

LUCERNE

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE—					
Benfuralin	Balan ..	5 600–8 400 ml	Pre-planting, incorporated	Most annual grasses and some broad-leaved weeds	May be applied from a few weeks to immediately before planting. Refer to manufacturer's label for incorporation methods and rates of application for different soil types
Chlorthal-dimethyl	Dacthal W75	11.20 kg	Post-planting, pre-emergence	Most annual grasses and broad-leaved weeds	Apply soon after planting lucerne and before weeds germinate. Follow with an irrigation (12–25 mm). May also be applied to emerged lucerne before weed emergence
POST-EMERGENCE—					
Atrazine	Several products	0.70 kg or 1 140 ml	Post-emergence. DO NOT spray lucerne stands under one year old	Mintweed seedlings ..	Will kill existing seedlings of mintweed and provide some residual control. Repeat spray during summer may be necessary. Slight leaf yellowing of the lucerne may result
2,4-DB	Several 40% products	2 800–4 000 ml	See remarks	Many annual broad-leaved weeds	<i>Seedling lucerne</i> should be sprayed when seedlings have from 1 to 8 trifoliate leaves. <i>Established lucerne</i> should be either mown or grazed and sprayed when the re-growth is up to 10–12 cm high. Lucerne should not be mown or grazed for about a week after application

LUCERNE—continued

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
POST-EMERGENCE— continued 2,2-DPA	Several products— mostly 74%	5.50 kg	Established lucerne ..	Most annual grasses and seedling perennial grasses. Established perennial grasses such as Rhodes grass if treatment is repeated	Add a 50%–60% non-ionic wetter in the proportion of 1 part wetter to 1 000 parts spray. Repeat spray applications as required during the months November to February. Do not exceed two applications in any one summer. Lucerne stands should be mown or grazed before spraying. Some suppression of lucerne growth may occur
		1.10 kg	Seedling lucerne ..	Seedling grasses up to 7 cm tall in <i>seedling</i> lucerne	Do not spray earlier than 2 weeks after emergence of lucerne. Add wetting agent as above

Weed Control Guide

SOYBEANS

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE— Trifluralin	Treflan ..	1 400 ml on light soils, to 2 800 ml on heavy soils	Pre-planting	Most annual grasses and some broad-leaved weeds	Thorough incorporation essential, follow manufacturer's directions. Residue damage may occur in winter cereals in a double crop situation. Barley is more tolerant than wheat and oats is least tolerant of all. Refer to manufacturer's label
Chlorthal-dimethyl	Dacthal W75	6.70 kg on light soils to 11.2 kg for heavy soils	Post-planting emergence pre-	Similar to Treflan ..	May be applied as a band over the crop row at proportionately lower rates per hectare of crop
Linuron	Linuron 50 Afalon	2.20 kg to 5.60 kg	Post-planting emergence pre-	Similar to Treflan ..	Beans should be sown at least 2 to 3 cm deep. If heavy rain falls after application some crop damage may occur. Do not re-sow other crops for at least 3 months. The best rate on Atherton Tableland is 3.4 kg/ha
Chlorthal-dimethyl/linuron mixture	Shamrox W.P.	8.00 kg on light soils to 13.00 kg on heavy soils	Post-planting emergence pre-	Similar to Treflan ..	May be applied as a band spray
POST-EMERGENCE— Bentazone	Basagran ..	1.5-2.0 l in 220-440 l water	When weeds are small, generally at 1-4 trifoliolate leaf stage of crop growth	Thornapple, Noogoora burr and bell-vine	The varieties Lee, Davis, Bragg Wills, Hill, Semstar and Hampton are tolerant to bentazone

MILLETS and PANICUMS

HERBICIDE rates in millilitres or Kilograms per HECTARE

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE			No pre-emergence chemicals commercially available		
POST-EMERGENCE— 2,4-D amine	Several 50% products	1 100 ml	When crop is stooling and secondary roots have developed	Most broad-leaved weeds	Avoid spray drift to neighbouring susceptible crops

NAVY BEANS

Herbicide	Trade Names	Rate of Application (product/hectare)	When Applied	Weeds Controlled	Remarks
PRE-EMERGENCE— Trifluralin	Treflan ..	1 400 ml on light soils to 2 800 ml on heavier soils	Pre-planting	Most annual grasses and some broad- leaved weeds	Incorporation is essential, follow the manufacturer's recommenda- tions. Refer to soybeans
Chlorthal-dimethyl	Dacthal W75	6.70 kg on light soils to 11.20 kg on heavy soils	Post-planting pre- emergence	Most annual grasses and some broad- leaved weeds	May be applied as a band over the crop row
POST-EMERGENCE ..			None commercially available		

GUIDE TO THE SUSCEPTIBILITY OF COMMON ANNUAL WEEDS TO HERBICIDES USED WITH SUMMER GRAIN AND OILSEED CROPS

Botanical Name	Common Name	Pre-Emergence				Pre- or Post-Emergence	Post-emergence except peanuts	Post-Emergence			
		Trifluralin Nitralin Benflurelin Dinitramine	Vernolate	Prepachlor	Alachlor	Atrazine	2,4-D amine	Dinoseb	Terdon 50D	2,4-DB MCPB	Bentazone
<i>Emex australis</i>	Spiny emex	R	—	—	—	PS	I	—	S	S†	—
<i>Trianthema portulacastrum</i>	Black pigweed	S	—	—	PS	S	I	—	I	I	R
<i>Portulaca oleracea</i>	Pigweed	S	R	S	S	S	I	S	S	I	S
<i>Chenopodium album</i>	Fat hen	S	S	S	S	S	S	I	S	I	S
<i>Amaranthus cruentus</i>	Redshank	S	S	S	S	S	S	—	S	S	PS
<i>Amaranthus macrocarpus</i>	Dwarf amaranth	S	R	R	S	S	S	S	S	PS	PS
<i>Amaranthus retroflexus</i>	Redroot	S	PS	S	S	S	S	—	S	PS	PS
<i>Amaranthus viridis</i>	Green amaranth	S	PS	S	S	S	S	—	S	S	PS
<i>Sesbania cannabina</i>	Sesbania pea	R	—	—	—	S	S	—	S	PR	R
<i>Tribulus terrestris</i>	Caltrop	I	R	R	R	S	I	S	I	—	—
<i>Anoda cristata</i>	Anoda weed	R	—	—	R	PS	—	—	—	—	S
<i>Hibiscus trionum</i>	Bladder ketmia	R	—	—	PR	S	I	S	I	—	S
<i>Ipomoea plebeia</i>	Bell-vine	R	R	—	R	S	S	S	S	S	S
<i>Ipomoea purpurea</i>	Morning glory	R	—	—	R	S	PS	PS	S	S	S
<i>Salvia reflexa</i>	Mintweed	R	PS	PS	S	S	I	S	S	S	—
<i>Datura ferox</i>	Fierce thornapple	R	PS	R	R	S	I	S	S	I†	S
<i>Datura stramonium</i>	Common thornapple	R	PS	R	R	S	I	S	S	I†	S
<i>Nicandra physalodes</i>	Apple-of-Peru, wild hops	R	—	S	S	S	S	S	I	S	—
<i>Physalis angulata</i>	Annual ground cherry	R	—	R	R	S	R	PS	S	R	R
<i>Physalis minima</i>	Wild gooseberry	R	—	R	S	S	R	S	PS	R	R
<i>Acanthospermum hispidum</i>	Star burr	R	—	S	—	S	S	S	—	S	S
<i>Bidens pilosa</i>	Cobbler's pegs	R	—	S	R	S	I	S	—	I	—
<i>Galinsoga parviflora</i>	Yellow weed	R	—	S	S	S	S	—	S	I	S
<i>Tagetes minuta</i>	Stinking Roger	R	—	—	S	S	S	—	S	S	—
<i>Xanthium pungens</i>	Noogoora burr	R	—	PR	R	S	S	—	S	S	S

Botanical Name	Common Name	Pre-Emergence				Pre- or Post-Emergence	Post-emergence except peanuts	Post-Emergence			
		Trifluralin Nitralin Benfluralin Dinotriline	Vernolate	Propachlor	Alachlor	Atrazine	2,4-D amine	Dincoseb	Terdon 50D	2,4-DB MCPB	Eentazone
<i>Xanthium spinosum</i> ..	Bathurst burr	R	—	PR	—	S	S	—	S	PS	R
<i>Cenchrus echinatus</i> ..	Mossman River grass	S	—	—	S	I	R	R	R	R	R
<i>Digitaria adscendens</i> ..	Summer grass	S	S	S	S	S	R*	R	R	R	R
<i>Digitaria sanguinalis</i> ..	Summer grass	S	S	S	PS	S	R*	R	R	R	R
<i>Echinochloa coloum</i> ..	Awnless barnyard grass	S	I	S	S	S	R*	R	R	R	R
<i>Echinochloa crus-galli</i> ..	Barnyard grass	S	I	S	S	S	R*	R	R	R	R
<i>Eleusine indica</i>	Crowsfoot grass	S	S	S	S	S	R*	R	R	R	R
<i>Eragrostis ciliaris</i> ..	Stink grass	S	PS	S	PS	S	R*	R	R	R	R
<i>Themeda quadrivalvis</i> ..	Grader grass	S	—	—	—	—	R	R	R	R	R
<i>Urochloa panicoides</i> ..	Urochloa grass	S	PS	S	S	R	R*	R	R	R	R

* These weeds are susceptible to 2,4-D as a pre-emergence treatment only (peanuts).

† Susceptible to 2,4-DB only.

S = Susceptible

R = Resistant

I = Intermediate (moderately susceptible)

— = Not known

PS = Probably susceptible

PR = Probably resistant

Susceptibilities are for the generally recommended rates of application and for post-emergence herbicides weeds should be young and growing vigorously.

Compiled by J. E. Rawson, Department of Primary Industries, Gatton Research Station in consultation with other Departmental Weeds Agronomists—July, 1976.

the Sunday joint

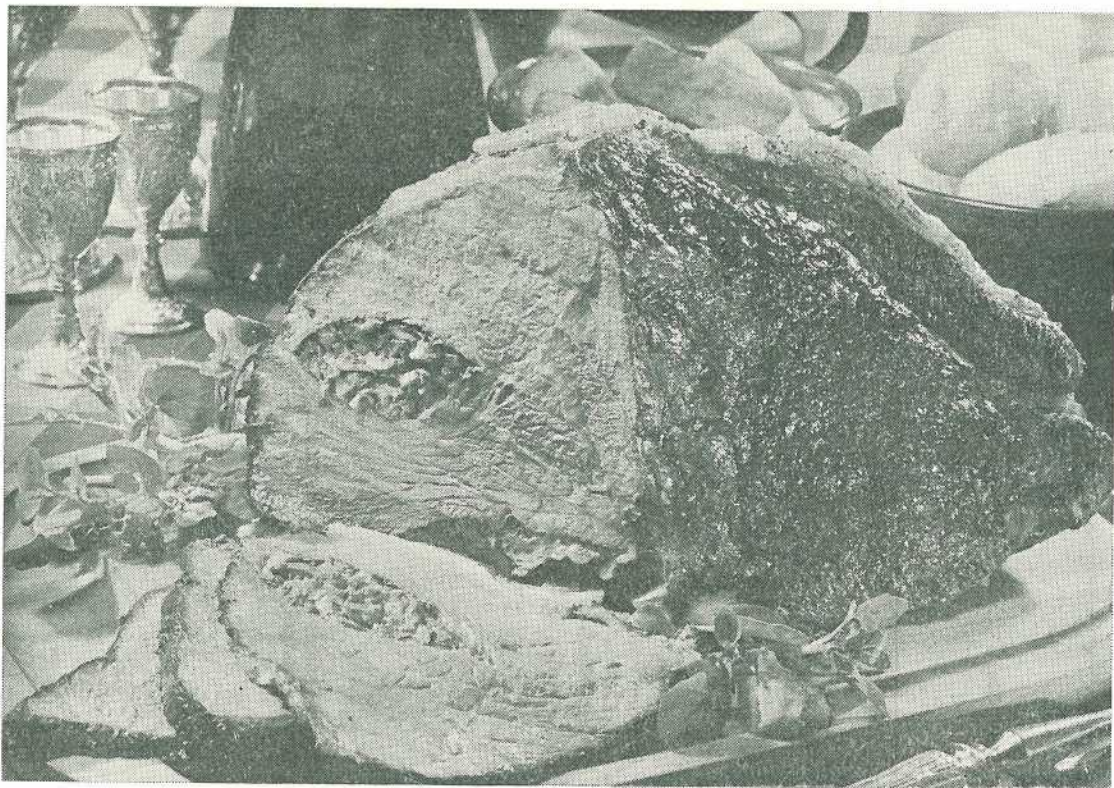
by Mrs. TESS MALLOS, Food Consultant, Australian Meat Board.

THE serving of a roast joint on Sundays is a ritual followed by many families. Though warmer weather induces some to move outdoors for this midday week-end meal, the cooler weather always heralds a return to tradition.

In Australian butcher shops there are a wide range of roasting joints available to suit all pockets and tastes. Because of their more attractive price, beef and lamb cuts head the list.

For a change, choose a joint which can incorporate a stuffing. Though packaged mixes are very convenient and quite tasty, one that you have whipped up yourself is much nicer.

The Australian Standard Metric 250 ml cup and levelled spoon measures are used in these recipes.



The "Sunday Roast" is still a tradition in many families and one which is always popular for tenderness and taste is a Toppide Roast. When stuffed to suit the family taste, a Stuffed Toppide Roast is hard to beat.

Herb and Bacon Stuffing

Ingredients

- 2 rashers bacon.
- 1 tablespoon butter.
- 1 small onion, finely chopped.
- 2 cups soft breadcrumbs.
- 2 tablespoons chopped parsley.
- ½ teaspoon dried thyme.
- ½ teaspoon dried marjoram.
- Salt and pepper to taste.
- 1 egg, lightly beaten.

Method

Remove rind from bacon and chop. Fry bacon in heated pan until fat renders. Add butter and onion and cook until onion is soft. Place remaining ingredients in a bowl, add bacon and onion and blend until stuffing holds together. Use for lamb joints such as boned out shoulder and forequarter; and to fill pocket of topside and bolar blade beef joints.



Guard of Honour

Ingredients

- 2 racks of lamb (6-7 cutlets on each).
- Salt and pepper.
- 2 tablespoons apricot jam.
- 1-2 tablespoons orange juice.

Stuffing

- 1 small onion, chopped.
- 2 tablespoons butter.
- 2 cups soft breadcrumbs (white or brown).
- 6 dried apricots, chopped.
- 4 prunes, pitted and chopped.
- 2 tablespoons orange juice.
- ¼ teaspoon dried marjoram.
- Pinch ground mace.
- Salt and pepper to taste.
- 1 egg, lightly beaten.

Method

Have butcher saw through chine bones on racks to facilitate carving, "French" the rib bones and interlock the two racks with the fat sides out.

Rub fat surfaces with salt and pepper. Press the apricot jam through a sieve and blend with orange juice to a glazing consistency. Brush onto fat and meat surfaces. Fill centre arch with stuffing (see end of method) and cover rib bones with pieces of foil to prevent scorching.

Lift Guard of Honour into roasting dish and cook in a moderate oven, 180°C (350°F), for 1 hour or until golden brown and cooked to taste. Rest for 10 minutes in a warm place.

Remove foil and replace with cutlet frills if desired. To serve, separate racks and carve into chops. Slice stuffing and serve with the lamb. Serve with gravy made from pan juices, roast potatoes, glazed carrots and a green vegetable. Serves 6.

To make Stuffing

Saute onion in butter until golden. Add to breadcrumbs with apricots and prunes (previously soaked in orange juice for 30 minutes), marjoram and mace. Season to taste and bind with egg.



Roast Stuffed Topside

Ingredients

- 2 kg corner cut topside or bolar blade in the piece.
- Salt and pepper.

Stuffing

- 2 rashers bacon.
- 1 tablespoon butter.
- ¼ cup chopped shallots or spring onions.
- 125 g mushrooms, chopped.
- 1 teaspoon lemon juice.
- Pepper to taste.

Method

Have butcher cut a deep pocket in the topside or bolar blade. Fill pocket with stuffing (see end of method) and secure opening with wooden cocktail picks or fine skewers. Rub salt and pepper into fat surface, pepper only into meat. Place on rack in roasting dish and cook in a moderate oven 180°C (350°F) for 40–55 minutes per kg (check with meat thermometer for degree of cooking desired). Rest roast in a warm place for 20

minutes before carving. Make gravy from pan juices and serve roast with baked vegetables and a boiled green vegetable. Serves 6–8.

To make stuffing

Remove rind from bacon and chop. Place bacon in a heated frying pan and cook until fat renders and bacon browns lightly. Add butter and shallots and cook for 2 minutes. Stir in mushrooms and lemon juice and cook until mushroom liquid evaporates. Season with pepper and cool before using.

Accounting and Planning for Farm Management

The second edition of this text book on Farm Management has just been printed.

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Mature Cheese ..

Savings in Storage Costs

by J. R. Dulley, Dairy Research Branch.

THE high costs of storing cheddar cheese until it matures adds substantially to its price. Methods to shorten the maturation period would result in significant savings.

A project to achieve these ends is being undertaken at the Otto Madsen Dairy Research Laboratory in Brisbane. Financial support for this work has been given by the Australian Dairying Research Committee.

The development of flavours characteristic of mature cheddar cheese is accomplished by enzymes present in the cheese. These enzymes are largely produced by the bacteria used as cheese starters. If the amount of enzymes present in the cheese could be increased the ripening process should be accelerated.

With this view in mind, vats of cheese have been manufactured on a pilot scale and enzymes have been added in various forms. The additions that have been the subject of most study are cheddar cheese slurries. These are preparations made from freshly salted curd by macerating it with saline. These slurries are then kept at 30°C for one week. Under these conditions mature cheese flavours develop in the slurries. These mature slurries are then added to salted cheese curd in the vat, mixed in well and the curd is hooped and pressed in the same way as normal cheese. Grading results show that these cheeses develop mature flavours more rapidly than normal cheeses do. The amount of advancement obtained is about two weeks after storage for one month, four weeks after three months, and six weeks after six months.

Other means of cutting the storage time are also under investigation. These include the addition to the vat of extracts from good quality mature cheese, and methods for increasing the numbers of starter organisms in cheese without effecting acid production during manufacture or the development of bitter flavours during maturation.

Present results have shown that maturation times for cheddar cheese can be shortened by a limited amount. The extent to which this time may be further reduced is now being studied with a view to maximizing saving to the dairy industry and consumers alike.

Take a hint

- Wrap sticky tape around pastels or crayons to prevent them from breaking, and keep little fingers from becoming stained.
- Put a spot of glycerine on each colour when children's paints have become hard. The paints will soon be soft and useable.
- Lids off hair spray cans are ideal for mixing children's paints. Saves saucers, or ice cube trays.
- Scraps of pre-pasted wallpaper, a bowl of water, scissors and a large cardboard carton to be decorated can keep a three-to-four year old occupied for hours.
- Unwanted needlework transfers, pressed with a hot iron on to the pages of an unlined exercise pad, make an excellent colouring book for children.

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Diseases of Pears - 1

Black Spot (Scab) of Pears

BLACK SPOT (or scab), caused by the fungus *Venturia pirina*, is a very serious disease of pears in Queensland. The symptoms and life history of black spot in pears and apples are similar but nevertheless the diseases are quite distinct; pear black spot will not affect apples and vice versa.

Routine spraying with fungicides is necessary to control this disease. William's Bon Chretien, Packhams Triumph and Clapps Favourite, with yellow to green fruit are more susceptible than Beurre Bosc or Winter Cole with brown fruit.

Symptoms

Leaves, terminal shoots and fruit are affected by the disease.

Leaf spots are olive-green in colour becoming dark-brown to black with age and occur on both leaf surfaces. Very young leaves often have these spots on the lower surfaces with a tendency to spread along the veins.

The spots may coalesce to cover almost the entire leaf. When the disease is severe, leaves are distorted, reduced in size and some defoliation occurs.

Fruit symptoms begin as small dark spots on the skin. These enlarge and become brown and corky in the centre with black broken margins. With further growth, these fruit become misshapen, cracked, and unmarketable.

Twig infection may be seen in pears when the disease is severe. Irregular purple or black patches develop on the stems and terminal growth.

Spread

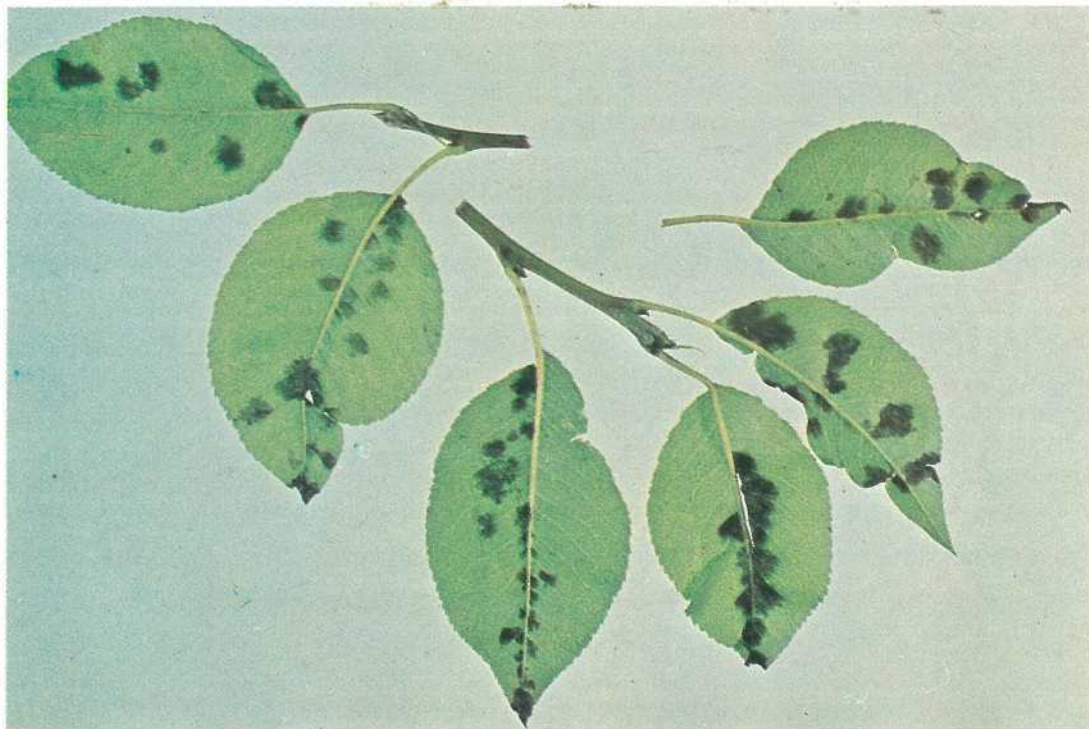
During winter, the fungus grows within old, infected pear leaves on the ground beneath the trees forming microscopic fruiting bodies known as perithecia. By early spring, enormous numbers of primary spores have been produced within these bodies.

Compiled by N.T. Vock, Plant Pathology Branch.

(Further information, including recommended fungicides, may be obtained from either the Plant Pathology Branch office at the Granite Belt Horticultural Research Station, Applethorpe, Q., 4378, or the Director, Plant Pathology Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Q., 4068.)



Diseases of Pears - 1



BLACK SPOT. Upper: leaf spots. Lower: spots on young fruit.