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The current pomegranate situation in Australia



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by Dianne Davidson

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Contents

- Executive Summary..... v**
- Introduction 1**
- Potential uses..... 2**
 - Fresh fruit..... 2
 - Juice 2
 - Arils..... 2
 - Other products..... 2
- Business and production factors 3**
 - Opportunities..... 3
 - Challenges..... 3
 - Market opportunities..... 4
- Current production issues 5**
 - Description of problems..... 5
 - Consideration of possible causes 5
- Outlook and Recommendations 8**
 - Short term outlook 8
 - Medium to long term outlook 8
 - Recommendations..... 8
- Appendix 9**

Figures

Figure 1	The tree above is four years old, healthy, cropping well and showing no symptoms.....	9
Figure 2	Five year old trees showing yellowing and branch-death symptoms with health trees in the same row.....	9
Figure 3	Four to five year old trees showing tree-death, but green suckers at ground level. Note the yellowing trees in the background, and a healthy tree in the foreground.....	10
Figure 4	Five to six year old freestanding trees in Sunraysia which developed yellowing symptoms and tree-death after heavy summer rains and have not recovered.....	10
Figure 5	Yellowing tree on the right against a healthy tree on the left.	11
Figure 6	The remnants of a pomegranate orchard in Sunraysia where 98% of the trees died after flooding. The remaining trees are healthy and green. All trees in this orchard were assumed to be the same variety.....	12

Executive Summary

This report has been prepared at the request of RIRDC to outline the issues impacting on the production of pomegranates in Australia, and the opportunities, challenges and potential for the pomegranate industry. In order to prepare the report discussions have been held with many commercial producers and the author has visited many of their orchards.

It is estimated that there are currently about 250–300ha of pomegranate orchard production in Australia, made up of two large orchards and a number of much smaller plantings. The earliest of these commercial plantings dates to about 2007.

There are several uses for the fruit utilising the antioxidant properties as an attractive market opportunity through fresh fruit, juice/beverages and arils (fresh or frozen). These are the markets currently being targeted by growers. There is also a range of other manufactured products such as oil, paste, cosmetics and medicinal products which might be considered. The author is unaware of any such large scale manufacturing of pomegranates currently in Australia, although there are a few niche products.

Whilst there are opportunities for this crop, there are also challenges, especially in the Australian context of a small, widely dispersed consumer population. Challenges include the distance to market, the requirement for cool storage of fruit and the low ‘usability’ of much of each fruit, up to 50% or more is waste. In many cases there is a need for growers to own much of their own grading, packing and cool storage infrastructure to achieve cost efficiencies.

There are some management issues for many growers regarding a tree condition, loosely described as ‘dieback’, where some trees, or part thereof, yellow with subsequent tree decline or death. The problem seems to appear randomly throughout orchards, across all varieties and regardless of the source or nature of the original germplasm. It is not at this current stage considered to be due to pests or disease. As most current producers are experienced fruit growers, this situation has led to considerable frustration, disappointment and some orchard removal. This report provides more detail. Several current producers have indicated to the author that they are unlikely to expand their plantings, and development of the industry, until the cause of the tree decline is better understood as their losses are significant.

No formal research has been undertaken on this ‘dieback’ condition, but increasingly growers are considering that there may be complex nutrition issues, particularly micronutrient requirements. Close investigation of the interaction between particular soil types, irrigation practices and nutrition may provide some answers.

In the short term, stronger domestic markets for fresh fruit and juice are needed to support the current level of production. The fruit, for all its potential health benefits, is still new to Australians. Consumers are unsure what to do with it or how to handle it and have somewhat unreasonable expectations about the external appearance. Further, a small quantity of whole fruit ‘goes a long way’; and so it is unlikely ever to become a mainstream fruit purchase in this country. Domestic market growth is likely to be slow, with only the continued development of specialty and niche markets by individual producers, until the “dieback” issue is resolved.

In the longer term, the development of a significant industry will depend upon the growth of both domestic and export markets in order to increase the volume of fruit grown. The potential of this industry hangs in the balance, and will depend on how growers and market and coordinate the industry development. There is a market window of opportunity of about 6 months in the northern hemisphere for fresh fruit from the Southern hemisphere, but market access protocols must first be established. Positive financial returns from participating in this market appear, at the present time, to be questionable.

Introduction

This report has been prepared at the request of RIRDC to outline the issues impacting on the production of pomegranates in Australia, and the opportunities, challenges and potential for the pomegranate industry. Information has been sourced from 20 or so growers in a number of locations; including visiting the orchards several times and having numerous discussions with the owners.

The pomegranate, *Punicum granatum*, is indigenous to central Asia and the Middle East. Whilst it is known to most Australians as an attractive ornamental garden shrub introduced by early settlers, it has a rich heritage dating back centuries and is at the centre of many ancient, and modern, cultural and religious traditions.

However, the commercial cultivation of the plant is relatively recent. The antioxidant properties of the edible portion of the fruit, the aril (the seed surrounded by red fleshy pulp), have recently become widely recognised. Since about 2000, the fruit and juice have enjoyed a rise in popularity in the health industry.

The popularity of the juice has encouraged large commercial plantings in the United States, predominantly in the Central Valley of California, where some 10,000ha are planted to a range of varieties, but predominantly 'Wonderful' or variants of that cultivar. There is a strong market for fresh fruit but much of the fruit produced is used for juicing to service the extensive US market; the juice is also exported.

Commercial plantings in Australia did not commence until the mid-late 2000s. The first large plantings of 2007-2010 were at Condobolin and Dareton in New South Wales, and in the Sunraysia and Goulburn Valley regions in Victoria. Further smaller orchards have been established from 2010-2014 in many locations including the Riverina, the South Australian Riverland and mallee, as well as in the Clare Valley and in SA's south east. At the peak, the total planted area might have been around 400ha, but all or portions of some of the older orchards have been removed, while others are experiencing, to a greater or lesser extent, significant management issues evidenced as tree death or decline (also commonly referred to as 'dieback' by some growers). These issues are described in section 4.0. It is the author's estimate that current plantings may total about 250-300 ha, with two large growers with 100ha or so, and maybe 20 growers with 2-20ha each. There is no official record of all plantings.

Potential uses

Fresh fruit

There is a market for fresh fruit in all the major population centres, with Australian grown fruit being available from March to October/ November. Fruit imported from the US comes onto the Australian market in October and can run through until April. Fruit is used as a fresh product and also for decorative purposes.

Whilst this outlet can be a source of good returns for producers, there is also high consumer expectation of fruit appearance which can be difficult to meet. Fruit must be externally blemish free even though the skin is not eaten. Growers report that achieving 'perfect' fruit is difficult on a large scale where sunscorch, wind rub or scratching by the tree's thorns cause 'skin deep' markings.

It is clear that Australian consumer find the fruit difficult to handle. Juicing the fruit or extracting the edible arils can be tedious and messy and 'a little goes a long way'. It is rare for a consumer to purchase more than two or three fruit at a time.

Juice

Australian pomegranate juice is sold in many retail outlets but usually always on a small scale. Most brands are produced in a 'boutique' fashion using somewhat basic techniques or modified equipment. The juicing of arils requires equipment which extracts the juice gently, so as not to include the bitter membranous and pithy parts of the whole. The author understands that some Australian fruit juicers are currently modifying other fruit juicing equipment in order to achieve this, albeit on a relatively small scale.

It is expected that commercial fruit juicers will increase their production in the near future, in response to consumer demand. However, there have also been consumer comments that the juice is 'too strong'; and that dilution of the juice, sometimes even by 50%, results in a more palatable product. This can be achieved with little or no change to flavour or appearance, depending on the variety. Again, 'a little goes a long way'.

Arils

It is possible to extract the fresh arils and package them for sale. Currently, they can be found in some retailers in 100-150 gm packs. These have a shelf life of about 12 days. There is a consumer demand for this product, but quality control and short shelf life is a major problem. The cost of production per unit pack is high and there is a limit to what the consumer will pay for this 'ready to use' product. Whilst the arils can be frozen which significantly extends their life, they must be used immediately upon thawing, again limiting the usefulness and incurring quality risks. A catering pack of 1 kg of frozen arils is also available.

This product could be an adjunct to fresh product and juice, but cannot stand alone.

Other products

The pomegranate arils can be used in many products from paste and oil to cosmetics and medicinal products; these are specialist manufacturing businesses and the author is unaware of any large scale operation in Australia at the present time. Boutique lines are occasionally seen, but it is not always clear whether the pomegranate ingredient has been grown in Australia.

Business and production factors

Opportunities

Commercial pomegranate production is possible in Australia given the suitable soils, climate and water resources. A very large number of varieties are cultivated in other countries and there is a wide range of germplasm already available in Australia. There are several uses for the fruit, the antioxidant properties of which provide market opportunity for a range of products which are increasingly recognised by the consumer.

Challenges

Infrastructure requirements

The fruits are heavy, ranging in weight from 200g to 600g each, sometimes more, depending on variety and production practices. The 'average' weight might be around 350-400g. The extraction rate for juice appears to be about 25-30%. The weight of arils per unit of fruit does vary with variety (and watering practices) but appears to range from 30-50% of total fruit weight.

It is unlikely to be cost effective to transport fruit for any distance for processing due to the weight and volume of the fruit and the relatively small percentage of it which can be used. Thus, producers in relatively isolated or remote locations will require their own grading, packing, juicing and aril extraction equipment. Cool storage is also absolutely essential for fruit if it is to be stored for more than a few days. Short term storage should be at 4-5 degrees Celsius; fruit destined for mid-long term storage (perhaps 3-4 months), prior to juicing, also requires treatment with fungicide before cool storage.

Current experience in Australia is that there are still many storage matters which require exploring; it appears unwise to consider storage for more than 3-4 months on current knowledge methodologies.

Costs of production

At the present time all fruit must be hand harvested, incurring significant labour costs. As fruit ripens over a number of weeks, it is normal practice to have two or even three harvesting sessions which results in major costs.

A trial in Sunraysia with a grape harvester resulted in significant fruit damage and almost immediate oxidation and spoilage of the arils. Whilst a means of mechanisation will probably be developed in time (but none seems to exist in other producing areas of the world at present), it will only ever be suitable for fruit destined for processing.

Some selective pruning may be carried out in most years; while this is currently a manual task incurring labour costs, a pruning machine may well be adapted if trees were to be grown in a hedged fashion. This is currently not practised anywhere to the author's knowledge.

The other operational orchard costs seem to be similar to those incurred in growing other tree crops.

Production and cultivation problems

Currently most, if not all, pomegranate growers in Australia are facing many issues with the management of their orchards, despite the fact that most are experienced fruit or grapevine growers and that the growing conditions are appropriate. Their problems are explained in more detail in section 4.0 of this report.

Biosecurity

Pomegranates grown in fruit fly declared regions cannot be exported, nor sent into fruit fly free areas domestically. This is a market limitation for several exiting growers.

Market opportunities

Domestic

With a small domestic population and market, there is difficulty in establishing any meaningful understanding of supply and demand in the Australian market place. Growers do report an increasing market demand, but lack of a well-managed route to market results in oversupply and lower prices from time to time. However, a steady supply of fresh fruit to market is needed if there is to be any chance of the fruit being seen as semi-mainstream.

Export

No Australian fruit is currently exported, but there is a 6 month window of opportunity to supply fresh fruit into the northern hemisphere markets in the months May-October. The cost of freight to this market will be high and may be prohibitive.

In order for any export to occur, market access protocols must be developed for each country. To the author's knowledge no such work has commenced.

Current production issues

Description of problems

Pomegranate trees have been grown for many years on a limited or trial basis in Australia but the larger commercial plantings really commenced in the mid-2000s. Despite the fruit growing experience of most growers, there has been mixed success and considerable disappointment. In most cases there has been a common problem which has become loosely known as 'dieback': The trees have generally grown well for the first two-three years after which their performance has become erratic, especially once cropping has commenced.

In summary, the symptoms described by most in all regions include:

- in midseason there is a premature yellowing of leaves, sometimes as a single branch, sometimes the whole tree;
- this yellowing is often, but not always, followed by quite sudden decline/death of the entire tree, but in most cases healthy looking green suckers grow almost immediately from the base of the plant;
- some growers have reported that the trees affected in one season do not seem to show any symptoms in the following season, while others report individual trees showing varying degrees of yellowing throughout a season;
- excessively wet ground caused by flooding in the Sunraysia area during the wet summers of 2010/11 and 2011/12 seems to have seriously exacerbated the problem for some orchardists. These particular conditions also caused the loss of some 20-30 year old trees in the district;
- the problem occurs across all varieties, with none being seen to be any more susceptible than others. The extent of the problem varies between trees within the same variety and within the same orchard, on apparently similar soil types. The problem appears to arise at random;
- growers have reported incidence of tree decline or death ranging from 2-25%, most reporting about 5-10%, even while other trees adjacent to the unhealthy ones remain green and productive. As tree density ranges from 800-1200 trees per hectare, many of the larger growers have thousands of trees and losses are a significant cost.

Photographs are attached in Appendix 1. Californian pomegranate researchers are investigating a similar issue.

Consideration of possible causes

Source of planting material

The author has been advised that over the last 5-6 years, about 5 or 6 nurseries have provided the trees (most not grafted) for the current mature plantings. These trees have been propagated using hardwood cuttings or tissue culture. The source of the parent material for this propagation activity has not been investigated for the purposes of this paper but some, perhaps most, have been imported from the US. The author is also aware of some germplasm which has been imported from Israel

However, the tree decline problem appears to occur regardless of the source, age or nature of the planting material. Growers who have purchased trees from 3 or 4 nurseries and then planted them adjacent in an orchard, find that the tree problem is not confined to a particular tree source or nursery.

The author is aware that pomegranate germplasm is being privately imported to Australia from Iran, by at least two entities in three states. These trees are currently either still in quarantine or only recently released into a nursery or planted in a field trial. There is no information on how these trees are performing as yet, but it may be that they will provide an alternative source of healthy and suitable material for Australian growers. On the other hand, the material may be retained solely for use by the importer.

Soil and water management

It is known that pomegranates require well drained soils with good water holding capacity and a reliable water resource for the purposes of irrigation.

The majority of plantings in Australia are scattered throughout the Murray Darling Basin and are therefore on generally well drained sandy loams or alluvial floodplains overlying calcareous parent material. All of these orchards utilise irrigation water from the Murray Darling river system. Areas of heavier sandy clays or poorly draining soil may occur sporadically within some plantings but generally comprise a small area of the whole. Other plantings in the Clare Valley and Padthaway regions of South Australia are on well drained sands or loams over limestone.

The investigation of growers' practices indicated the use of 3-6 ML/ha of irrigation water, depending on seasonal conditions. Most use soil moisture monitors as well as experience gained with other perennial fruit crops, to guide water usage. Drip irrigation is by far the most common technology used (2 lines per tree row) but some overhead sprinklers are still in use.

No growers reported excessive water use, however the loss of so many trees after the summer flooding events of 2010/11 and 2011/12, described in 4.2.1, indicates the sensitivity of root systems to poor/slow soil drainage.

Tree loss or decline has been reported on all soil types and with all of the different irrigation regimes.

Nutrition

Most growers have used a nutrition program similar to that which has been used on other crops, be it stone fruit, citrus or grapevines. Such programs typically entail the use of proprietary forms of the macronutrients nitrogen, phosphorus and potassium, possibly blended with a range of micronutrients.

As the tree decline problem has emerged, some growers have used sap and tissue tests to indicate the trees' nutritional status. This has resulted in some ad hoc applications of iron, zinc, manganese copper, magnesium and molybdenum, either separately or in combination, in an attempt to green the foliage and redress the problem. The results have been very mixed. However, there has been sufficient response, particularly to zinc, to suggest that further research into the micronutrient requirements of trees is warranted. This idea is supported by the fact that all of these micronutrients are known to be, or to become, less available in calcareous soils. It may not be a coincidence that most of the orchards displaying symptoms of tree decline are on such soils.

Pest and disease

The Californian experience as well as that documented in research from Iran, India and China is that the fruit is susceptible to a number of common fungal or bacterial infections and so regular spray programs are required. The Australian experience to date is different, with only copper and sulphur being applied on a semi regular basis. None of these diseases are considered likely to cause death of the tree.

Samples from roots of declining trees and the surrounding soil have been tested by different Department of Agriculture laboratories in all states and no significant pathogenic fungi have been isolated. A range of more common soil borne fungi such as *Pythium*, *Fusarium* and *Phytophthora* have

been identified but these are common in many, if not most, soils used for horticulture and expert advice is that they would not, alone, lead to the death of a tree.

Cropping stress

The problem appears to develop once trees reach a cropping stage, which may be as early as year two, suggesting a physiological stress brought on by flowering or setting fruit. But, the degree of the problem does not always reflect the size of the crop being carried and not all trees in an orchard or within the same variety are affected. Any physiological stress is likely to be the result of some other factor affecting the individual tree.

Environmental stress

As already mentioned, conditions leading to flooding or standing water do cause tree health problems. There is also a suggestion that excessive soil temperatures in heatwave conditions, in dry sandy soils may add an unmanageable stress to a heavily cropping tree due to the nature of the tree's relatively shallow and spreading root system.

Outlook and Recommendations

Short term outlook

Many experienced fruit growers have become frustrated and have lost some confidence with the erratic and unpredictable performance of trees and have indicated to the author that they are unlikely to expand their orchards until the cause of the tree decline is better understood, as the costs of losses is significant.

Development of stronger fresh fruit and juice markets is required to support the existing producers. This would be assisted by a more consistent supply of fruit from growers which in turn would improve with more consistent tree performance both within and between seasons.

Medium to long term outlook

Any development of a significant pomegranate industry in Australia is likely to be some years away. Domestic market growth is likely to be slow with the development of specialty and niche markets by specialist producers.

A larger scale Australian industry would be entirely dependent on the existence of both domestic and export markets. Development of an export market is essential for both fresh and processed product in order to move volume, but it can only occur once market access protocols have been developed. The financial benefits of participating in the export market would need a rigorous investigation, given the distances and freight costs involved.

Recommendations

- In order to retain the horticultural skills of current pomegranate growers in this industry, there is an urgent need for some research into the interaction between soil types, irrigation practices, nutrition and soil borne pathogens. It would be particularly important to include collaboration with the Californian pomegranate researchers. This research would hopefully lead to new knowledge and increased confidence in the crop by current and potential growers.
- Horticulture Australia Ltd (HAL) has the mandate to match industry financial contributions, and so the pomegranate industry is encouraged to seek the commissioning of the suggested areas of research with HAL and industry financial contributions.

Appendix



Figure 1 The tree above is four years old, healthy, cropping well and showing no symptoms.



Figure 2 Five year old trees showing yellowing and branch-death symptoms with health trees in the same row.



Figure 3 Four to five year old trees showing tree-death, but green suckers at ground level. Note the yellowing trees in the background, and a healthy tree in the foreground.



Figure 4 Five to six year old freestanding trees in Sunraysia which developed yellowing symptoms and tree-death after heavy summer rains and have not recovered.



Figure 5 Yellowing tree on the right against a healthy tree on the left.



Figure 6 The remnants of a pomegranate orchard in Sunraysia where 98% of the trees died after flooding. The remaining trees are healthy and green. All trees in this orchard were assumed to be the same variety.

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