

Activity # 1- Assessing Horticultural Crop Suitability for the Queensland Murray Darling Basin Study Area

Specific Biophysical Crop Information - Broccoli

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Activity 1 — Project Team

David Carey¹, Senior Horticulturist, Activity Leader 2015 -16

Peter Deuter², Senior Principal Horticulturist, (Crop Specialist)

Dr Andrew Zull³, Resource Economist

Heather Taylor⁴, Senior Project Officer (GIS)

Dr Neil White⁵ Principal Scientist, (QMDB Climate Data Analysis)

1. Department of Agriculture and Fisheries, 41 Boggo Road, Dutton Park GPO Box 267, Brisbane Qld 4001

2. Formerly Department of Agriculture and Fisheries LMB7, MS 437, Gatton, QLD, 4343

3. Department of Agriculture and Fisheries 203 Tor Street, Toowoomba QLD 4350

4. Formerly Department of Agriculture and Fisheries Primary Industries Building, 80 Ann Street, Brisbane QLD 4000

5. Department of Agriculture and Fisheries 203 Tor Street, Toowoomba QLD 4350

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Broccoli

Based on the biophysical requirements and limiting factors, **Broccoli is a potential crop** for the Balonne-Border Rivers Region of the QMDB.

Crop Matrix:-

	Annual Crop	Broccoli
Currently Grown (Y/N)	Qld	Y
	QMDB	Y
	NSW	Y
	Vic	Y
Frost Sensitivity (N or Deg C)	Seedling	- 5°C
	Growth	N
	Reproductive	- 5°C
Low Temp Sensitivity (Y/N or Deg C)	Seedling	N
	Growth	N
	Reproductive	- 1°C
High Temp Sensitivity	Seedling	N
	Growth	N
	Reproductive	30°C
Rainfall Sensitivity	Y/N	Y
	Growth Phase	Heading
Special Soil Requirements	Y/N	N
	Requirement	-
Chilling Req.	Y/N	N
	Amount (hrs)	-
Water Quality	Sensitivity (dS/m)	2.8 (3.9)
First Planting Date	(Month)	Feb/March
Last Planting Date	(Month)	June
Consecutive Plantings	(Y/N)	Y
First Harvest	(Month)	May
Last Harvest	Month)	Aug
Length of harvest	(weeks)	12
QMDB	Y/N	Y

Biophysical Requirements and Limiting Factors (climate)

Broccoli requires a cool climate, especially during floral initiation and head maturation.

Low Temperature

The **floral initiation** stage is most sensitive to freezing injury. At this stage, yields are significantly reduced at -1°C and -3°C, and shoot apices will be killed at -5 °C (Tan, 1999 and Bjorkman and Pearson, 1998).

“There was no significant yield reduction when the inflorescence **buttoning** stage was subjected to -1°C and -3°C. Although shoot apices at **buttoning** survived the -5 °C treatment, very poor quality heads of uneven bud size were produced as a result of arrested development” (Tan, 1999).

“The lethal temperature for pot-grown broccoli was between -3°C and -5°C, whereas the lethal temperature for field-grown broccoli was between -7°C and -9°C. The difference was presumably due to variation in cold acclimation” (Tan, 1999).

High Temperature

Bjorkman and Pearson (1998) identified sensitive developmental stage of broccoli. ‘Galaxy’ broccoli was exposed to 35°C for 1 week at varying developmental stages. This study found that meristems were affected only if heat was applied during inflorescence production or the floral initiation process. Shorter heat exposures produced little injury, and longer exposures were lethal. This study also found that broccoli plants are more sensitive to freezing injury during floral initiation.

“Once inflorescence or head development is initiated, relatively high temperatures (30°C) arrest head development. The typical flaws that result include incomplete head development, uneven bead size, bracting in heads, and rough head surface” (Farnham and Borkman, 2011).

Rainfall

Rainfall during head maturation increases the incidence of diseases such as heat rots (bacteria) and white blister (fungus).

Soils

Soils are not critical, although with the majority of vegetable crops, well drained soils are an advantage, but especially critical if production occurs in the wet season.

Broccoli can be grown on a wide range of soil types, from light sandy loams through to heavy clay loams. However, the soil must be well drained, regardless of type.

Broccoli Lifecycle

Guide to number of weeks from transplanting to harvest

Season	Cabbage		Cauliflower		Broccoli	
	Lockyer & coastal	Highland areas	Lockyer & coastal	Highland areas	Lockyer & coastal	Highland areas
Autumn/spring	10 – 12	12 – 14	10 – 12	12 – 14	8 – 10	10 – 12
Winter	13 – 16	*	12 – 14	*	10 – 13	*
Summer	*	9 – 11	*	9 – 11	*	8 – 9

*not commercially viable at these times of the year

Comparison Region(s)

Commercial broccoli is grown across a large number of regions, soil types and climates in Australia. Temperature (and to some extent seasonal rainfall) is the determining factor in the location and seasonal production of broccoli in Australia.

In Queensland, summer production occurs only in the cooler highland areas of the Granite Belt and eastern Darling Downs. Winter production occurs mainly in the Lockyer Valley.

Prime Growing Areas



Main planting and harvesting times in the major production districts

District	Crop	Plant	Harvest
Lockyer and Fassifern Valleys and Eastern Darling Downs	Cabbage	Mid February to August	Late April to early November
	Cauliflower	Mid February to July	Late April to September
Highland regions	Broccoli	Mid February to August	Mid April to mid October
	Cabbage	Mid August to February	Mid November to May
	Cauliflower	September to February	December to May
Southern coastal areas	Broccoli	Mid August to early March	November to May
	Cabbage	February to mid August	Mid April to September
	Cauliflower	Mid March to June	May to mid September
	Broccoli	February to mid August	April to early October

Source: Agrilink - Brassica Growers Handbook (2004).

Broccoli in the QMDB Region.

Based on the biophysical requirements and limiting factors, Broccoli is a potential crop for the Balonne-Border Rivers Region of the QMDB.

References

- Agrilink - Brassica Growers Handbook (2004). Heisswolf, S., Carey, D., Walsh, B., Lovatt, J., Rigden, P., Chapman, L., Davis, R., Henderson, C., and Bagshaw, J. Department of Primary Industries and Fisheries, Queensland.
- Bjorkman T. and Pearson K. (1998). High temperature arrest of inflorescence development in broccoli (*Brassica oleracea* var. *italica* L.). *J Exp Bot* 49(318):101–106.
- Farnham. M. and Thomas Bjorkman, T. (2011). Breeding Vegetables Adapted to High Temperatures: A Case Study with Broccoli. *HortScience* Vol. 46(8) August 2011.
- Tan, D.K.Y., Wearing, A. H., Rickert, K.G., Birch, C. J. and Joyce, D.C. (1999). *Australian Journal of Experimental Agriculture*, 1999, **39**, 771–80.

Disclaimer: The candidate crop information presented in this QMDB study area report (Activity 1) are based on the analysis of the published biophysical needs of the crops (e.g. temperature, frost sensitivity, chill requirement, water quality, etc.) and current climate records for the QMDB study area. The candidate crops are deemed suited to the study area where the biophysical needs are met either year round or for portion of the year and will allow crop production.
