

## ***Can Double Break crop rotations be effective and profitable across the wheatbelt? Part 1 – Grain yield***

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### *Key Messages*

- Wheat grain yield was higher where legumes were included in the double break compared to canola
- Double break crop rotations can provide effective weed and disease control if well managed

### *Background*

In Western Australia, break crop options are currently limited and there is a high proportion of wheat and barley grown across the WA grain growing region. Cereal crops account for 60-70% of paddocks sown in any one year, with the remaining area sown to a range of crop and pasture types including canola, lupin, clover, volunteer pasture, or left as fallow. The application of these break crops is dependent on the on the presence and severity of biological, chemical, and physical constraints present in each paddock that can impact on the successful growth of the break crop. The use of a single break crop has been an effective tool in managing weed and disease constraints, however, a change in resistance status of many common weeds and population dynamics of soilborne pathogens has reduced this effectiveness. The use of two break crops in a row as a double break crop sequence has been successfully used to increase the grain yield of successive wheat crops in South Eastern Australia, and this study has tested this approach in the WA wheatbelt region.

Four demonstration sites were established in 2017 near Bencubbin, Corrigin, Miling, and Calingiri. These sites were established in paddocks with a history of root diseases or weed populations that a single break crop could not address, and which were sown to a break crop, pasture, or fallow in 2016. In 2017, plots of up to 2 hectares in size were established using grower equipment for a range of break crop options that the grower identified as options to integrate into their farming system. The remaining area of the paddock was sown to either wheat or canola depending on grower's paddock plan. All sites were sown to wheat in 2018. Break crop types are presented in Table 1.

### *Results*

Grain yield for the second break crop at the demonstration sites in 2017 was highest for lupin and varied in a range of 0.97 t/ha to 1.42 t/ha, while chickpea, lentil and field pea yielded 0.67-1.1 t/ha, 0.3-0.97 t/ha, and 1.2 t/ha respectively (Table 1). The use of a fallow was an effective method of increasing soil moisture to benefit the growth of chickpea and lentil in what was considered a dry year. The yield of wheat at the demonstration sites following legume break crops tended to be higher than comparisons of canola or wheat planted in the remaining paddock area. The driver of increased grain yield of wheat following legume breaks appeared to be the fixation of N rather than the reduction in root disease levels as changes in soil disease levels did not reflect differences in grain yield (data not presented). Each legume crop had a different influence on the profile of soil diseases, and this led to either a decrease or change in composition of soil diseases (data not presented). In particular the increased prevalence of *P.neglectus* due the susceptibility of chickpea (and canola) was most pronounced and this is an issue that will need to be managed in the future as growers look to introduce a high value legume species into their crop rotation to improve profitability. A thorough evaluation by growers of break crop species will be important in the future to ensure effective control of paddock specific root diseases.

Table 1. Grain yield of wheat in 2018 at each demonstration site following various break crops and their grain yield in 2017. nd = not determined. Demonstration site data only, no replication at each site. Grain yield determined by hand harvest cuts in each year.

Site	2016 crop	2017 crop	2017 yield (t/ha)	2018 Wheat yield (t/ha)
Bencubbin	Fallow	Canola	0.6	2.1
		Lentil	0.6	2.8
		Lupin	1.42	2.6
		Kabuli Chickpea	0.6	2.8
		Desi Chickpea	1.1	3.4
Calingiri	Wheat	Lentil	0.36	6.2
		Lupin	0.97	5.7
		Canola	nd	5.6
Corrigin	Fallow	Albus lupin	0.8	3.9
		Chickpea	0.9	4.0
		Field peas	1.2	4.1
		Lentil	0.3	4.1
		Wheat	2.4	3.8
Miling	Pasture	Lupin	0.97	nd
		Lentil	0.82	nd
		Chickpea	0.67	nd

### Discussion

The use of a double break crop rotation where two break crops are grown successively has the potential to increase wheat production in the Eastern Wheatbelt where the first crop is a chemical fallow. It is critical to manage this as a clean chemical fallow to ensure that rainfall is captured and stored in the soil and that weed populations are reduced. These conditions can facilitate the growth of high value legumes such as chickpea or lentil with potentially lower production risk and provide both soilborne disease and N fixation benefits compared to canola.

The use of canola (with effective weed control) as the first break crop in the central wheatbelt may be an effective way of offsetting the potential issue of reduced weed control options in chickpea and lentil. Further research to de-risk the adoption of high value legumes such as chickpea and lentil will give growers a greater chance of implementing a profitable and effective break-crop rotation. This includes the demonstration of effective weed control strategies and the equipment and management practices needed to reduce harvest losses and maximise grower returns.

The full report can be found on the WMG website [www.wmggroup.org.au](http://www.wmggroup.org.au)

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