Strip Cropping Vegetables

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Abstract

A field trial in Tasmania was established in September 2003 to examine the practicality and benefits of strip cropping three vegetables, namely onions, broccoli and potatoes. Yield and disease data suggest that growing broccoli in close association with potatoes has the potential to increase the average harvested weight of broccoli by 16g per plant, while reducing the incidence of white blister rust (*Albugo candida*). Potato yield and disease incidence was not significantly affected by strip cropping, while the onion yield was significantly higher in the monoculture compared to strip cropping.

Media summary

Research investigating the strip cropping of vegetables indicated that growing broccoli in close association with potatoes could increase the yield and quality of harvested broccoli without affecting the yield and quality of potatoes.

Key Words

Strip cropping, broccoli, potatoes, onions, *Albugo candida*.

Introduction

Tasmanian vegetable cropping systems are based on large-scale paddock-to-paddock rotations of single crop monocultures. The use of large-scale monocultures in vegetable cropping has facilitated higher yields and at the same time made management of increasingly larger land holdings easier. However, this gain in production and ease of management, in many cases, has a potential environmental cost due to the large quantities of chemical inputs required as well as problems associated with long-term soil structural decline and erosion.

A vegetable cropping system that amalgamates each crop monoculture into alternating strips of crops may distribute labour, chemicals and water inputs across the landscape during the growing season. A vegetable strip cropping may also allow complementary interactions that in some crops have been shown to have greater system resilience (Theunissen 1997; Wolfe 2002), greater production at crop edges (Clark and Myers 1994; Ayisi et al. 1997; Ghaffarzadeh et al. 1997; Smith and Carter 1998), reduce insect pest incidence (Theunissen and Schelling 1996; Ramert 2002), disease transfer (Finckh and Wolfe 1997; Garrett and Mundt 1999; Wolfe 2000) and deliver environmental benefits such as greater soil and water conservation potential (Gilley et al. 1997; Theunissen 1997; Poudel et al. 1999; Gilley et al. 2002).

Methods

Three vegetables, onions, broccoli and potatoes, were selected for a field trial, which was established at the Forthside Vegetable Research Station on Tasmania's north west coast in September 2003. The trial area of approximately 1.2 hectares consisted of a completely randomised block design of nine 30m x 30m blocks with 10m buffers (Figure 1). Three of the blocks were single species "mono-cultures" (one for each crop), while the remaining six blocks had two sub plot repetitions of three 5m strips of each crop, planted using all possible combinations.

Figure 1. Picture of the trial layout from 8/01/04

The crops were monitored for diseases, insect pests and plant competition effects. Management challenges encountered were also documented. Yields were determined and the produce was assessed for quality and size specific to each crop.

Results

The first season field trial results indicate that broccoli produces approximately 16g more per harvested head when grown next to potatoes compared to broccoli monoculture (Figure 2.) These results are in accordance with Santos et al. (2002) who concluded that broccoli plants are suitable for intercropping with potatoes due to their temporal asynchronies of growth rates and different leaf canopy structures.

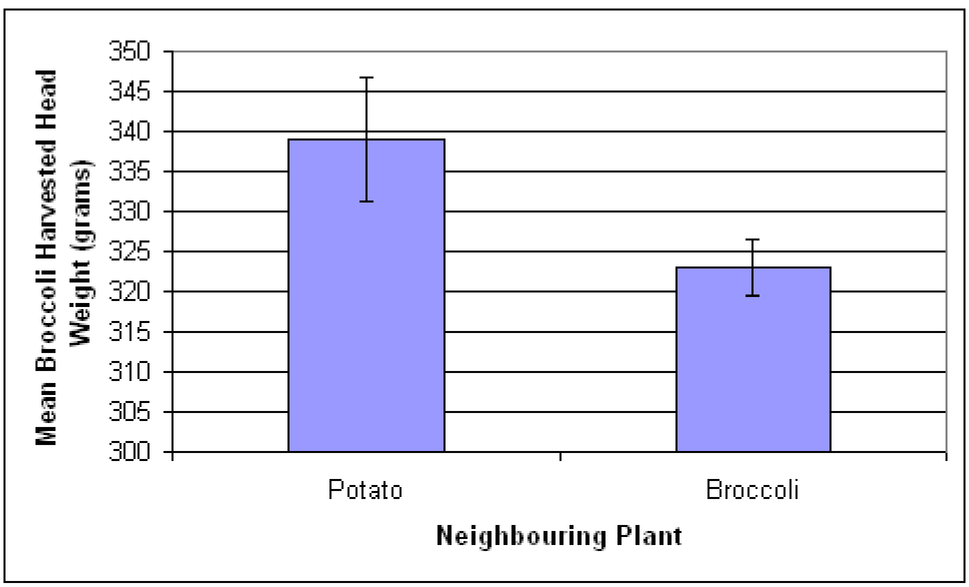

Figure 2. A row of broccoli grown with a row of potato plant neighbours (n=10) produced higher mean head weights (p=0.045) when compared to rows of broccoli only growing between rows of other broccoli plants (n=82).

The incidence of broccoli harvest rejection due to white blister rust (*Albugo candida*) was 7% lower when rows of broccoli grown next to rows of potatoes were compared to rows of broccoli grown next to rows of broccoli (Figure 3). These results are in accordance with findings from Finckh and Wolfe (1997) who suggest that plant species mixtures in cropping systems have a greater disease resistance due to non-host effects of the different components in the mixture when exposed to a pathogen diluting the inoculum.

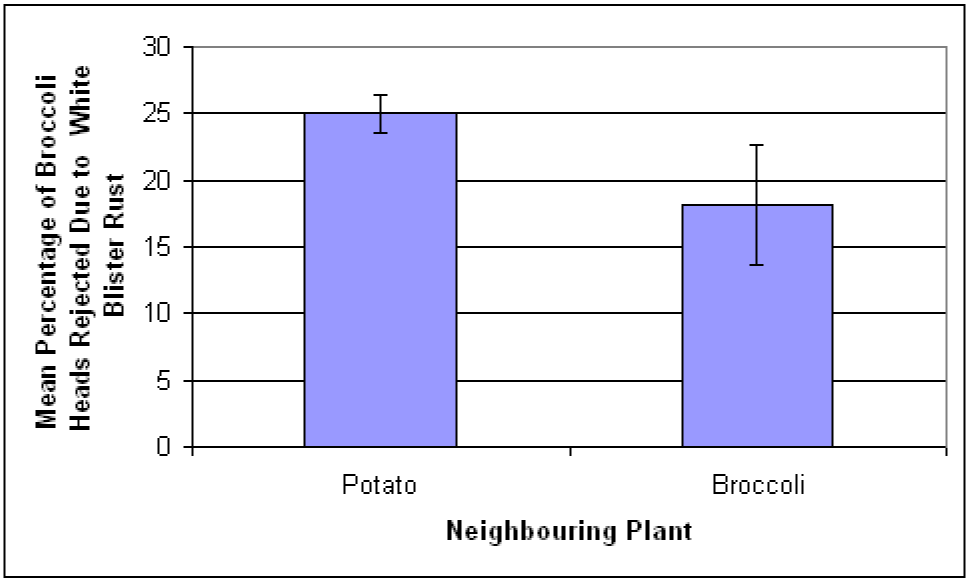

Figure 3. A row of broccoli grown with a row of potato plant neighbours (n=10) had fewer heads rejected due to an infection with white blister rust (*Albugo candida*) (p=0.039) when compared to rows of broccoli only growing between rows of other broccoli plants (n=82).

Higher yields of onions were produced in monoculture compared to strip cropping. This might be attributed to the ability of potatoes and broccoli plants to out-compete onion plants for resources. As illustrated by Figures 4, broccoli canopy architecture had the ability to branch out across the rows and starve onion plants on the row edges of light. The yellowing of the onion plants was especially evident after the mechanical incorporation of harvested broccoli (Figure 5).

Figure 4. Picture of broccoli plants shading onion plants.

Figure 5. Yellowing of onions visible after the incorporation of neighbouring broccoli plants.

The strip cropping system had no significant effect on yield and disease incidence in the potato crop.

The major management challenge faced was the misalignment of crop strips which resulted in the over spray of herbicides and hence damage to neighbouring crops.

Conclusion

Growing broccoli in close association with potatoes has the potential to increase broccoli production and reduce the severity of White Blister Rust (*Albugo candida*) on broccoli crops. There is evidence suggesting that onions are not suitable to the strip cropping system trialed.

A practice of establishing all crop beds before the planting of the first crop should be incorporated into further trials to eliminate the misalignment of crop strips in the system and reduce herbicide damage to neighbouring crops.

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