THRIPS (THYSANOPTERA) ASSOCIATED WITH RICE CROPS IN THE MURRUMBIDGEE IRRIGATION AREA, NEW SOUTH WALES

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Summary

Seventeen commercial rice crops in the northern section of the Murrumbidgee Irrigation Area in southern New South Wales were sampled for thrips in the 2001/2 and 2002/3 rice seasons to determine whether oriental rice thrips (*Stenchaetothrips biformis* (Bagnall)), which is established in southern Queensland, had spread to the New South Wales rice area. Twenty-one species of thrips were identified from 2220 specimens collected, however in each season four taxa, *Thrips imaginis* Bagnall, *Anaphothrips obscurus* (Müller), *A. sudanensis* Trybom and *Haplothrips* spp. together accounted for 84% or more of total collections. No other taxon exceeded 5% of captures in either season. Oriental rice thrips was not detected. There is no evidence to indicate that thrips communities found on rice during this survey were causing economic damage to the crop.

Keywords: *Oryza sativa*, Thripidae, Phlaeothripidae, Aeolothripidae, *Thrips*, *Anaphothrips*, *Haplothrips*

INTRODUCTION

Thrips are common in rice crops throughout the world, and have been reported as pests in many rice producing countries. Oriental rice thrips, *Stenchaetothrips biformis* (Bagnall), is the most widely known thysanopteran rice pest and is considered a serious problem in Bangladesh, China, India, Indonesia, Japan and Sri Lanka (Pathak and Khan 1994). *Haplothrips aculeatus* (Fabricius) and *H. ganglbaueri* Schmutz have also been reported to cause substantial crop damage in parts of Asia (Pathak and Khan 1994, Dale 1994), although Reyes and Rillon (1994) have questioned the pest status of *H. ganglbaueri*, suggesting this species may actually be predacious.

Oriental rice thrips is widely distributed throughout Southeast Asia and the Indian subcontinent, and has also been recorded from South America and Europe (CABI 2010). There is strong evidence that its range is continuing to expand, particularly in South America. It was recorded from Guyana in 1994, Venezuela in 1995, and was subsequently found in Trinidad in 1997 (White 2000). In Australia it was first recorded by Mound and Houston (1987) from material collected in the Brisbane area, and although the species is now considered established in eastern Australia (Mound and Gillespie 1997) there are no publically available records of it occurring on Australian rice crops (Mound and Houston 1987, APPD 2010).

Western flower thrips (*Frankliniella occidentalis* (Pergande)) is now widely distributed in Australia (Mound and Gillespie 1997), however it was not found in the Murrumbidgee Irrigation Area (MIA) until 2004 (S. McDougall, I & I NSW, *pers. comm.*) and we therefore did not expect to find *F. occidentalis* in the samples collected during this survey. Western flower thrips has been reported as a minor rice pest in the USA, as has onion thrips (*Thrips tabaci* Lindeman) (Lange *et al.* 1970). Neither is considered a significant rice pest in Asia, although other *Frankliniella* species have been associated with rice crop damage (Pathak and Khan 1994).

Although efforts are currently being made to re-establish commercial rice production in parts of northern Australia, the industry is still largely confined to the Murrumbidgee and Murray Valleys in southern New South Wales (NSW). Thrips are not currently considered as pests of rice in this area, and the possibility of oriental rice thrips expanding its range southwards into the rice growing areas represents a significant threat to industry biosecurity. Due to their lack of pest status, thrips have not previously been studied in NSW rice crops. Our study was conducted to obtain baseline information on the composition of thrips communities on rice in NSW, and to determine whether any species recognized as pests of rice are present in the area.

MATERIALS AND METHODS

Seventeen rice crops were surveyed during this study, eight in the 2001/2 rice season (17 December 2001 – 9 January 2002) and nine in the 2002/3 season (2 - 31 January 2003). All the crops were located in the area bounded by Yanco, Yenda, Willbriggie and Griffith in the MIA along the northern boundary of the NSW rice cropping zone. This survey area was selected because it would probably be the first rice area infested by oriental rice thrips if this species expands its range southwards. Coordinates for all sites were logged using a Garmin® GPS 60 global positioning unit. Sites are shown in Figure 1.

Survey crops were chosen on the basis of uniform plant stand and an absence of aquatic weeds. All crops were between late vegetative growth and early grain filling at the time of sampling. White plastic trays (320 x 238 x 58 (depth) mm) were used to sweep aerial parts of the rice plants and thrips were aspirated into collection tubes. Two people spent approximately 1 hour collecting thrips in each crop. The thrips were immobilized in a freezer and transferred into AGA (600 mL L^{-1} aqueous ethanol:glycerol:glacial acetic acid 10:1:1) for 48 hours, and then to 600 mL L^{-1} aqueous ethanol for storage prior to slide mounting in Hoyer's medium. Thrips were identified using the keys of Mound and Gillespie (1997).

RESULTS

A total of 2220 thrips were collected, with 21 species being identified (Table 1). In total, some 31.2% of the thrips collected were referred only to genus, with the majority of these (29.7% overall) belonging to the genus *Haplothrips* Amyot and Serville. Of the 21 identified species, there were 14 species of Thripidae, three of Phlaeothripidae and four of Aeolothripidae.

The data shows a high degree of consistency across the two survey seasons. Despite the relatively large number of thrips taxa recognized, in each season the same four taxa together accounted for the vast majority of thrips collected (84.9% in 2001/2 and 89.9% in 2002/3). These taxa were *Thrips imaginis* Bagnall (plague thrips), *Anaphothrips obscurus* (Müller), *A. sudanensis* Trybom and *Haplothrips* spp. No other species accounted for 5% or more of total captures in either season. Oriental rice thrips was not collected during the survey, and as anticipated western flower thrips was also absent from our samples. Economically significant thrips damage to rice was not reported by growers prior to or during this survey.

DISCUSSION

Although a large number of thrips species were collected from rice crops in the MIA, the majority were present only in small numbers, and some taxa had presumably dispersed into the rice crops without necessarily feeding on the rice itself. *Australothrips bicolor* Bagnall is one species potentially in this category. Although 57 individuals of this species were collected from rice plants, *A. bicolor* is known to feed on *Eucalyptus* leaves (Marullo and Mound 1997), however at high population levels it may be found on nearby crops (Mound and Gillespie 1997). As with many thrips species, the full range of its true host plants remains unknown (Marullo and Mound 1997).

Plague thrips constituted some 20.5 % of collected specimens across the combined seasons, and whilst it

Figure 1. Thrips survey sites. Only 15 sites are indicated because 2 sites (1 and 7) were sampled in both seasons of the study. Sampling dates were: site 1, 17 Dec 2001 and 2 Jan 2003; sites 2 and 3, 20 Dec 2001; sites 4 and 5, 21 Dec 2001; site 6, 8 Jan 2002; site 7, 8 Jan 2002 and 2 Jan 2003; site 8, 9 Jan 2002; sites 9 and 10, 7 Jan 2003; site 11, 9 Jan 2003; sites 12 and 13, 15 Jan 2003; site 14, 23 Jan 2003; site 15, 31 Jan 2003. Reference localities: Leeton 34° 32'S 146° 24'E; Griffith 34° 16'S 146° 02'E.

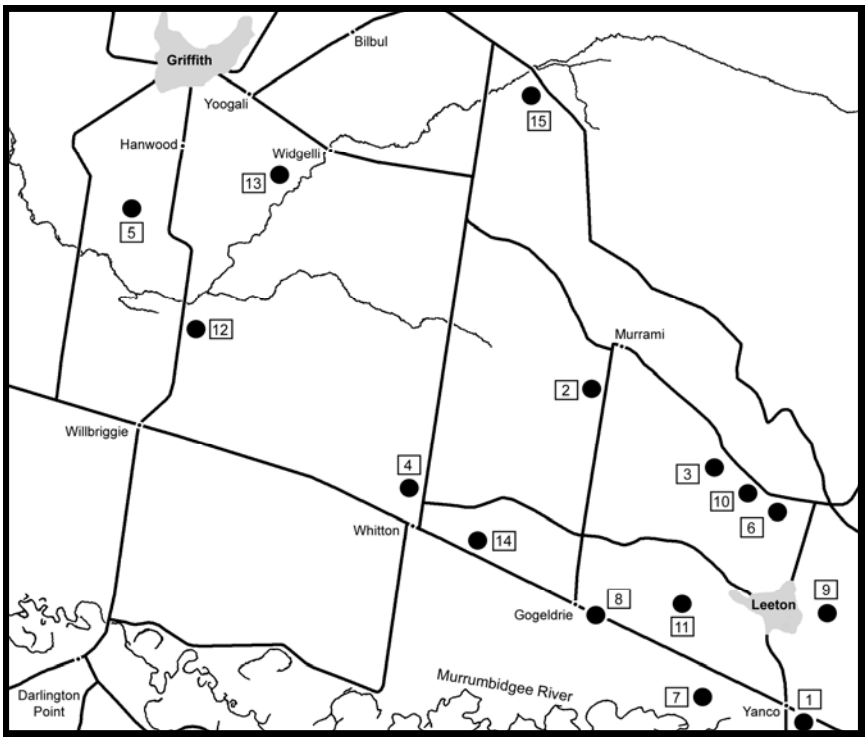

Table 1. Thrips identified from a survey of 17 rice crops in the Murrumbidgee Irrigation Area during the 2001/2 and 2002/3 rice seasons.

Family	Species	2001/2 season		2002/3 season		both seasons combined	
		total (*n* = 8)	% of total	total (*n* = 9)	% of total	total (*n* = 17)	% of total
Thripidae	*Thrips imaginis* Bagnall	105	10.3	351	29.2	456	20.5
	Thrips tabaci Lindemann	20	2.0	10	0.8	30	1.3
	Thrips australis (Bagnall)	0	0	3	0.3	3	0.1
	Anaphothrips obscurus (Müller)	407	39.9	177	14.7	584	26.3
	Anaphothrips sudanensis Trybom	52	5.1	196	16.3	248	11.2
	Anaphothrips cecili Girault	3	0.3	0	0	3	0.1
	Anaphothrips sp.	29	2.8	3	0.3	32	1.4
	Pseudanaphothrips achaetus (Bagnall)	2	0.2	0	0	2	0.1
	Tenothrips frici (Uzel)	14	1.4	4	0.4	18	0.8
	Australothrips bicolor Bagnall	6	0.6	51	4.2	57	2.5
	Frankliniella schultzei (Trybom)	21	2.1	32	2.7	53	2.4
	Arorathrips mexicanus (Crawford)	31	3.0	0	0	31	1.4
	Caliothrips striatopterus (Kobus)	1	0.1	0	0	1	0.1
	Chirothrips manicatus Haliday	0	0	1	0.1	1	0.1
	Scirtothrips albomaculatus Bianchi	0	0	1	0.1	1	0.1
	Scolothrips sp.	0	0	2	0.2	2	0.1
Phlaeothripidae	*Haplothrips (Haplothrips) froggatti* Hood	9	0.9	0	0	9	0.4
	Haplothrips (Haplothrips) victoriensis Bagnall	5	0.5	0	0	5	0.2
	Haplothrips (Trybomiella) robustus Bagnall	1	0.1	0	0	1	0.1
	Haplothrips spp.	302	29.6	357	29.7	659	29.7
Aeolothripidae	*Andrewarthaia kellyana* (Bagnall)	2	0.2	9	0.7	11	0.5
	Desmothrips propinquus (Bagnall)	4	0.4	4	0.3	8	0.3
	Desmothrips tenuicornis (Bagnall)	4	0.4	0	0	4	0.2
	Desmothrips steeleae Mound	1	0.1	0	0	1	0.1
	Total	1019	100%	1201	100%	2220	100%

can be found on many plant species, it is regarded primarily as a pest of pome and stone fruit in Australia (Lewis *et al.* 1997, Mound and Gillespie 1997) and has not been recognized as a pest of rice. Two *Anaphothrips* species were particularly abundant in our samples, together constituting 37.5% of collected specimens. Both *A. obscurus* and *A. sudanensis* are cosmopolitan grass-feeding species (Pitkin 1978, Mound and Masumoto 2009), and *A. obscurus* is recognized as a pest of rice (Pathak and Khan 1994). Reyes and Rillon (1994) found *A. sudanensis* widespread in Philippine rice fields, whilst *A. obscurus* was common in Japanese fields (Takahashi 1979). Lange *et al.* (1970) considered *Proscirtothrips zeae* (Moulton) [under the name *Anaphothrips longipennis*] to be damaging to young plants in California (see Hoddle *et al.* 2008). Australian *Haplothrips* species were difficult to identify with the keys of Mound and Gillespie (1997), leading to problems evaluating their potential role in Australian rice ecosystems. More recent literature (Mound and Minaei 2007) now allows for the easier identification of Australian *Haplothrips* species. Whilst many species appear to be associated with the flowers of grasses, some seem to be purely predatory, and only *H. victoriensis* Bagnall has been implicated as being both predatory and phytophagous (Bailey and Caon 1986, Mound and Gillespie 1997).

Thrips communities in NSW rice crops appear to be quite diverse, with 21 species-level taxa identified from crops in a relatively small geographic area. There has been comparatively little work done on thrips communities in rice elsewhere as most thrips research has focused exclusively on oriental rice thrips, which is the most significant thysanopteran pest of rice globally. Reyes and Rillon (1994) conducted an extensive survey program across 13 provinces in the Philippines and found 23 thrips species on rice, a very similar total to that in our study, however they did not find any species of Aeolothripidae.

No oriental rice thrips were detected during our survey. Western flower thrips were also not detected, and this is consistent with evidence from horticultural crops that indicates this species was not present in the MIA prior to 2004. Onion thrips, reported as a minor rice pest by Lange *et al.* (1970) constituted less than 2% of the total thrips collected. Ongoing biosecurity surveys will be necessary to assess the extent of dispersal of oriental rice thrips from current areas of infestation in southern Queensland, and although there is no evidence that the thrips species found in NSW rice crops during our survey are causing economic damage, it would be useful to conduct laboratory feeding tests on *Anaphothrips obscurus*, *A. sudanensis* and *Haplothrips* spp. to determine whether these numerically dominant taxa are feeding directly on rice. This information would be of value in the event of a plant disease outbreak that may be associated with insect vectors.

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