CHEMICAL CONTROL OF WHITE TIP NEMATODE OF RICE IN EGYPT

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Abstract

Two field experiments were carried out at Sakha Agricultural Research Station farm in 2002 and 2003 seasons. Three nematocides, Furadan G 10% (carbofuran), Mocap G 10% (ethoprophos) and Temik G 15% (aldicarb) were evaluated for the control of white tip nematode as soil application on the susceptible rice cultivar Giza 171. Furadan as applied at two rates (6 & 12 kg / fed),and each of Mocap and Temik was applied at 5 and 10 kg / fed . The nursery (just before seed broadcasting) and/or permanent field (30 days after transplanting) were treated. The results indicated that all treatments of nursery significantly reduced the number of nematode larvae/10 plants and number of infected leaves (severity) than the untreated plots. Mocap and Furadan with low or high rates of the nursery application gave the best results compared with the permanent field application 30 DAT. The severity of infection was lower at the second season (2003) as compared with the first one (2002). No significant differences were found between high and low rates of Mocap or Furadan applied in the nursery. Severity of infection ranged from 4.76 to 10.67 infected leaves /m^2, while severity of infection was higher with high or low rates of Temik which ranged from 47.33 to 76.33 infected leaves/m^2 compared with untreated plots (149 infected leaves/ m^2). Panicle length decreased by white tip infection compared with the healthy panicles. Significant increase in grain yield was found from almost all treatments compared with the control.

INTRODUCTION

White tip nematode disease is caused by *Aphelenchoides besseyi* Christie. It was recorded in many countries, including Australia, Cuba, India, Italy and the Philippines (Fortuner 1970). Also, it has been reported from Japan and USA (Huang and Huang 1972). Rahman and Miah (1989) mentioned that the highest disease incidence with the largest nematode population per plant was observed at booting or flowering stage of rice crop. In Japan, Yoshii and Yamamoto (1950) estimated 10 to 35 % losses in rice yield due to nematodes. Todd and Atkins (1958) reported that white tip causes reduced panicle length and weight, seed per panicle and increased sterility of panicle. Sivakumar (1988) reported that the avoidable yield loss under different methods of planting was 6.1 % (transplanting) and 10.4 % (directly seeded) in IR50 and 10.9 % (direct sown) in TKM-9. On the other hand, Prasad *et. al.* (1987), in India, mentioned that the white tip nematode

caused yield losses of up to 20%. They added that isofenphos was the most effective treatment in controlling and reducing nematode numbers and in increasing grain yield followed by carbosulfan. Choi *et. al.* (1989) reported that seed disinfection of rice by seed soaking slurry seed treatment combined with using Diazinon, Prochloraz, Benomyl, Fenthion and Phenthoate and Fenitrothion were highly effective against *A.besseyi.* Also, they found that the chemicals used as spray or broadcast to paddy fields in Korea were relatively less effective than seed soaking treatments. Sehly *et al* (2003) found that nursery treatments with Mocap or Furadan were the best treatments that lowered number of infected leaves / m^2 and number of larvae / seedling compared with Temik or untreated control. This study aimed to control white tip nematode in rice using lower amounts of nematocides in the nursery than the higher amounts applied in the permanent field to avoid the pesticide pollution as possible.

MATERIALS AND METHODS

Two field experiments were carried out at Rice Research and Training Center farm, Sakha, Kafr El-Sheikh, Egypt in 2002 and 2003 seasons. Three nematocides, Furadan G 10% (carbofuran), Mocap G 10% (ethoprophos) and Temik G15% (aldicarb) were evaluated for the control of white tip nematode as soil application on the susceptible rice cultivar Giza 171. Furadan was applied at two rates (6 & 12 kg / fed), each of Mocap and Temik was applied at 5 and 10 kg / fed. Both nursery (just before seed broadcasting) and permanent field (30 days after transplanting) were applied either alone or combined together, Table (1).

Table 1. Nematocides and their combination treatments as rate and time of applications.

No.	Chemical	Rate / fed.	
		Nursery	30-DAT
1	Furadan	6 kg	-
2	Furadan	12 kg	-
3	Furadan	12 kg	6 kg Furadan.
4	Furadan	12 kg	5 kg Mocap.
5	Furadan	-	6 kg Furadan.
6	Mocap	5 kg	-
7	Mocap	10 kg	-
8	Mocap	10 kg	6kg Furadan.
9	Mocap	10 kg	5 kg Mocap.
10	Mocap	-	5 kg Mocap.
11	Temik	5 kg	-
12	Temik	10kg	-
13	Temik	10kg	6 kg Furadan.
14	Control	-	-

Disease assessments:

Severity of infection was evaluated by counting number of infected leaves per m^2 in each plot, just before heading or late booting in both seasons. Healthy and infected panicles were measured (in cm) on five panicles at the late maturity stage in each plot. To count larvae ,10 seedlings (just before transplanting) were collected from each nursery treatment, washed, cut into small pieces and placed in water, Syracuse watch glasses. After twenty-four hours, the number of nematode larvae was counted under the stereoscopic microscope. At the maturity stage, five infected and healthy panicles were collected from each plot, cut into small pieces and placed in water Syracuse to count nematode larvae as previously mentioned.

RESULTS AND DISCUSSION

The results indicated that all treatments significantly reduced the number of larvae/10 plants and number of infected leaves (severity) compared to the untreated plots (Table 2). Mocap and Furadan with low or high rates of the nursery application gave the best results compared with the permanent field application 30 DAT alone. The severity of infection was lower at the second season (2003) compared with the first season (2002) for the most treatments, Table (2). No significant differences were found among high or low rates for Mocap or Furadan used as nursery applications in both seasons. In the first season, the severity of infection for nursery treated with Mocap and Furadan ranged from 4.67 to 10.67 infected leaves /m^2, while severity of infection for those treated by Furadan or Mocap at the permanent field only gave 35.00 and 95.33 infected leaves /m^2 respectively. On the other hand, the severity was higher with high or low rate for nursery applications of Temik nematocide which ranged from 47.33 to 76.33 infected leaves/m^2 compared with untreated plots with 149 infected leaves/ m^2. This result is in agreement with the findings of many investigators (Jonathan and Bvelayuthan 1984, Popora *et al.*1984, Prasad *et al* 1987 and Zhang &Ai 1995). They found some chemicals like isofenphos was the most effective treatment in controlling and reducing nematode numbers and increasing grain yield followed by carbosulfan, however, Benomyl was ineffective against the nematode Cho *et al* (1987) mentioned that the effective chemical control methods for the nematode in paddy fields were seed disinfections before seedling, and carbofuran 3% treatment before transplanting and carbofuran 3% water surface treatment at the early stage of injury.

Table 2. Effect of rates and time of applications of three nematocides on severity of infection, number of larvae/10 seedlings and grain yield on Giza 171 rice cultivar.

No.	Chemical	Rate / fed.		2002			2003		
		Nursery	30-DAT	Severity	No. of larvae	Yield t / fed.	Severity	No. of larvae	Yield t / fed.
1	Furadan	6 kg	-	10.67	4.33	6.85	8.67	2.23	5.93
2	Furadan	12 kg	-	7.33	2.33	7.77	7.00	1.67	5.89
3	Furadan	12 kg	6 kg Fur.	8.00	2.33	7.90	6.00	1.67	6.14
4	Furadan	12 kg	5 kg Moc.	8.33	2.33	8.20	6.21	1.67	6.78
5	Furadan	-	6 kg Fur.	35.00	29.33	6.55	16.83	18.00	6.23
6	Mocap	5 kg	-	10.00	2.67	7.12	10.45	2.00	6.37
7	Mocap	10 kg	-	4.67	1.67	7.80	6.33	1.33	6.10
8	Mocap	10 kg	6kg Fur.	5.67	1.67	7.60	5.00	1.33	6.31
9	Mocap	10 kg	5 kg Moc.	8.00	1.67	7.13	6.67	1.33	6.20
10	Mocap	-	5 kg Moc.	95.33	29.33	6.80	28.33	18.00	5.80
11	Temik	5 kg	-	76.33	11.33	6.70	66.67	7.00	5.79
12	Temik	10kg	-	47.33	10.33	6.90	44.33	5.67	6.71
13	Temik	10kg	6 kg Fur.	55.67	10.33	6.80	38.00	5.67	5.57
14	Control	-	-	149.00	29.33	5.70	85.67	18.00	5.86
LSD 5 %				21.19	3.92	1.16	16.22	3.14	1.09

In the first season, data in Table (2) indicated that the number of larvae /10 seedlings were lower for all nursery treatment applications by Mocap and Furadan either at high or low rates which ranged from 1.67 to 2.67 for Mocap and from 2.33 to 4.33 larvae / 10 seedlings for Furadan. The number of larvae for the treated Temik at the nursery was higher , ranging from 10.33 to 11.33 larvae. On the other hand, the numbers of larvae / 10 seedlings at nursery was 29.33 larvae. The same trend was obtained in the second season (2003). Number of larvae for infected panicles was higher than healthy ones and ranged from 12.0 to 28.30 larvae per 5 panicles. The highest number was obtained from untreated plots (control), while the lowest number was obtained from plots treated with Mocap at a rate of 10 kg /fed. at nursery plus 5 kg / fed at the permanent field, Table (3). Concerning the number of larvae from five visually healthy panicles, data in Table (3) show that the number of larvae ranged from 0.80 larvae for Furadan treatment 12 kg / fed at the nursery application plus 6 kg /fed at the permanent field (30-DAT) to 4.46 larvae for untreated plots (control). The same trend was obtained in the second season, 2003. These results are in agreement with the finding of Todd and Atkins (1958), who reported that presence of nematodes in the seed was verified by microscopic examination of rice seed for susceptible varieties. A small percentage of the nematodes became active within an hour, but the maximum number could be detected after 12-24 hour. Most of the nematodes were found on the inner surface of the hulls, but some occurred on the kernel and the number of viable nematodes per seed was 1-14. Also, Rahman and Miah (1989) reported that approximately 25% of seed samples collected from farms or from fields at harvest were found to be infected with *Aphelenchoides besseyi* nematode. About 73.5% infected seed sample had 2-25 nematodes / 100 seeds. The length of infected

panicles ranged from 14.20 to 16.10 cm compared with the healthy panicle which were ranged from 19.40 to 21.40 cm in season 2002. In 2003, the length of infected panicles ranged from 14.40 to 16.80 cm, while the healthy panicle length ranged from 19.20 to 22.10 cm Table (4). Todd and Atkins (1958) mentioned that white tip infection reduced panicle length, weight, number of seed per panicle and increased sterility. Significant increase in grain yield was found from most treatments compared with the control.

Table 3. Density of nematode larvae in rice panicles of Giza 171 as influenced by nematocide applications.

No.	Chemical	Time /Rates		Number of larvae / 5 panicle			
				2002		2003	
		Nursery	30-DAT	Infected	Healthy	Infected	Healthy
1	Furadan	6 kg	-	18.40	2.12	16.00	2.00
2	Furadan	12 kg	-	14.00	1.30	13.00	0.10
3	Furadan	12 kg	6 kg Fur.	13.20	0.80	12.00	0.40
4	Furadan	12 kg	5 kg Moc.	14.00	1.00	12.00	0.10
5	Furadan	-	6 kg Fur.	18.40	3.10	23.00	2.00
6	Mocap	5 kg	-	15.60	1.80	16.00	1.40
7	Mocap	10 kg	-	14.80	1.20	13.00	0.80
8	Mocap	10 kg	6 kg Fur.	12.50	0.90	10.10	0.10
9	Mocap	10 kg	5 kg Moc.	12.00	1.10	12.00	0.40
10 .	Mocap	-	5 kg Moc.	21.00	2.82	16.00	1.10
11	Temik	5 kg	-	19.50	4.12	18.00	3.10
12	Temik	10kg	-	16.15	3.00	12.00	2.00
13	Temik	10kg	6 kg Fur.	14.50	2.14	18.00	0.80
14	Control	-	-	28.30	4.46	26.00	3.10
LSD				1.64	0.46	1.49	0.33

Table 4. Panicle length of Giza 171 as influenced by nematocide applications.

No.	Chemical	Time /Rates		2002		2003	
		Nursery	30-DAT	Panicle length (cm)		Panicle length (cm)	
				Infected	Healthy	Infected	Healthy
1	Furadan	6 kg	-	16.00	19.40	16.80	19.20
2	Furadan	12 kg	-	15.80	20.00	16.20	19.40
3	Furadan	12 kg	6 kg Fur.	15.80	20.10	15.60	20.00
4	Furadan	12 kg	5 kg Moc.	16.00	20.80	15.50	21.20
5	Furadan	-	6 kg Fur.	14.60	19.60	14.80	20.80
6	Mocap	5 kg	-	16.10	20.80	16.40	20.20
7	Mocap	10 kg	-	16.00	21.00	15.80	21.00
8	Mocap	10 kg	6kg Fur.	15.20	21.20	14.87	21.33
9	Mocap	10 kg	5 kg Moc.	15.40	21.40	15.20	21.80
10	Mocap	-	5 kg Moc.	15.80	21.10	16.00	21.80
11	Temik	5 kg	-	14.60	19.80	16.00	20.80
12	Temik	10kg	-	14.60	19.60	14.40	21.50
13	Temik	10kg	6 kg Fur.	15.10	20.00	15.40	22.10
14	Control	-	-	14.20	19.40	15.00	20.80
LSD				1.10	1.40	1.12	1.43

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المقاومة الكيماوية لمرض القمة البيضاء النيماتودى في الأرز في مصر

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مركز البحوث و التدريب فى الأرز- معهد بحوث أمراض النباتات - *مركز البحوث الزراعية* – مصر

تم إجراء تجارب هذا البحث بالمزرعة البحثية لمحطة بحوث سخا خلال موسمي ٢٠٠٢ ، ٢٠٠٣ . استخدمت ثلاثة مبيدات نيماتودية هى الفيوردان ١٠% والموكاب ١٠% والتيميك ١٥% محببات تم تقييمها لمقاومة مرض القمة البيضاء النيماتودى في الأرز عوملت بها التربة على الصنف القابل للإصابة جيزة ١٧١ . تم استخدام معدلين لكل مبيد بالنسبة للفيوردان ٦ ، ١٢ كجم / فدان أما بالنسبة لكل من الموكاب والتيميك فاستخدم المعدلان ٥، ١٠ كجم / فدان. تمت الإضافة في المشتل في نفس يوم بدار التقاوي أو في الأرض المستديمة بعد ٣٠ يوم من الشتل أو الاثنين في معاملة واحدة .

وقد أظهرت النتائج مايأتي :

- كان عدد اليرقات لكل ١٠ نباتات أقل معنويا في جميع المعاملات عنه في المقارنة و أيضا شدة الإصابة وهى عدد الأوراق المصابة .جاءت أفضل النتائج عند المعاملة بالموكاب أو الفيوريدان سواء كانت المعاملة بالمعدل المنخفض (٥ ، ٦ كجم / فدان) أو العالي (١٠، ١٢ كجم / فدان) في المشتل بالمقارنة بإضافتها في الأرض المستديمة أو بالغير معاملة أو المعاملة بالتيميك.
- كما أظهرت النتائج أن شدة الإصابة في موسم ٢٠٠٣ كانت أقل بالمقارنة بنتائج موسم ٢٠٠٢ . ولا توجد فروق معنوية في شدة الإصابة بين المعدل المنخفض أو المعدل المرتفع في معاملة المشتل خلال الموسمين سواء كانت المعاملة بالموكاب أو الفيوريدان .تراوحت شدة الإصابة من ٤,٧٦ إلى ١٠ أوراق مصابة /م٢ لكل من الموكاب والفيوردان بينما كانت أعلي في التيميك حيث تراوحت من ٤٧,٣٣ الى ٧٦,٣٣ أما فى الغير معاملة فكانت شدة الإصابة ١٤٩ ورقة مصابة /م٢ .تأثر طول السنبلة بالإصابة بالنيماتودا حيث قل طولها في النباتات المصابة عنها في السليمة كما وجدت زيادة معنوية في وزن المحصول في كل المعاملات بالمقارنة بالقطع الغير معاملة.