CONTROL OF GARLIC FLY, *DELIA* SP. (DIPTERA: ANTHOMYIIDAE) AUTUMN GENERATION BY MEANS OF SEED COATING PESTICIDE

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[Khaghaninia, S., Pourabad, R. F. & Mohammadi, D. 2009. Control of garlic fly, *Delia* sp. (Diptera: Anthomyiidae) autumn generation by means of seed coating pesticide. Munis Entomology & Zoology, 4 (2): 493-497**]**

ABSTRACT: Garlic fly, *Delia* sp. is one of the most important pests of garlic in the Tarom area. In order to control the pest autumn generation, this study was carried out as completely randomized design block experiment considering two different Carbaryl treatments in three replications. The results showed that seed coating with 4 g/ Lit Carbaryl solution gave the satisfied control against garlic fly attack and increased the yield more than 50.78% in comparison to the control but seed treatment with Carbaryl powder in rate of 2 g/kg of garlic seed, illustrated moderate control. The emerged seedlings number during about one- month intervals showed no significant differences among the treatments and control but seed coating especially with Carbaryl solution produced the most robust seedlings.

KEY WORDS: Garlic fly, *Delia* sp., Pesticide control, Seed coating, Carbaryl.

Garlic *Allium sativum*, planted in more than 1800 hectares squares, is a very economic crop in Tarom region. There are complex of garlic and onion flies in this area and we did not identify these species because from the growers' point of view, control measures are independent of species (Mohiseni, A. A., 2002). Through investigations which were conducted in Poland, a complex of seed flies belonged to *Delia* genus were reported as follows: *Delia antique, D. platura and D. florilega* in which *D. antique* was the dominant species (Narkiewicz-Jodko, 1988).

This pest is cosmopolitan and its distribution area includes Northern America, Western Europe, China, Japan, Korea, former USSR and in Central Asia it rises up to 3600 m above sea level, absent in deserts (Elberg, 1981 and Martinson et al., 1988).

The pest larvae damage garden bulb garlic, and also onion, chive, underground onion (shallot), leek, bulbs of tulips. The first generation of the fly is the most harmful because the development of larvae coincides with the beginning of garlic growth. Hatching larvae go into bulb pulp from the root side or through the base of leaves. Larvae hatching from one egg-batch usually keep together and eat away rather big cavities in bulbs. Sometimes more than 50 larva feed on one bulb, originating from eggs laid by different females. Damaged seedlings leaves become yellowish, wilt and finally they are destroyed completely (Gailite, 2002, Martinson et al., 1988 and Park and Lee, 1988).

This pest has two generations in autumn and spring in Tarom and the autumn one is very destructive. Females lay egg in autumn synchronizing with garlic planting, then the larva could be seen at garlic generating time. Larva attack newly emerged seedlings and fresh bulbs, cut the stem base and finally cause wilting, rooting and damping of plants (Mohiseni, 2002).

The various experiments showed seed dressing and granules are the most economical forms of applying insecticides to control the garlic fly which are least harmful to the environment (Emmett, and Savage, 2007, Ester, 1994 and Narkiewicz-Jodko, 1988). Park, and Lee (1988) reported that *Hylemia antique* is the most serious pest of garlic in Korea and showed applications of Diasinon and Carbufuran as granules is the best method of control. Martinson et al. (1988) indicated that the damage increase with more fertilizer in garlic fields. Szwejda (1988) showed the effective control was achieved by applying insecticides as granules or sprays during the oviposition period with Diazinon 25% EC and Triazophos 40% EC.

Among available seed pesticides, Carbaryl was recommended as the most effective one to control garlic fly in Tarom gardens (Mohiseni, 2002). Carbaryl (Sevin)^R is a wide-spectrum carbamate insecticide which controls over 100 species of insects, with contact and stomach action, moderately toxic to aquatic organisms, breakdown in soil and vegetation and therefore has low to moderate half- life in water, soil and inside crops and finally is a pesticide with low to moderate toxicity to humane and other non- target organisms (Nkedi-Kizza and Brown, 1998).

This study was carried out in Tarom area, in order to decrease pesticides use as one of the IMP strategies and also to introduce seed treatment instead of common ineffective spring spraying of pesticides against garlic fly and also to compare two types of Carbaryl seed coating,.

MATERIALS AND METHODS

This research was carried out during 2001 and 2002 in Dastjerdeh, a village in Tarom area, as experiment in completely randomized design block with two treatments of Carbaryl 85% WP besides the control in three replications. The treatments were seed coating with 4 g/ Lit Carbaryl solution and Carbaryl powder in rate of 2 g/kg of garlic seed. Nine plots were prepared in 3×3 design which the area of each was 300 m^2 in a randomized pattern.

After preparing the seeds, in the first treatment they were left 5 minutes in Carbaryl solution and for the second treatment after wetting, seeds were mixed completely with Carbaryl powder. Special gloves and mask were used during preparation of seed treatment. Seeds were planted in conventional method and control plots left without any treatments in first of November.

In order to determine the effects of insecticides on control of garlic fly, the numbers of healthy emerged garlic plants on each plot were recorded about one-month intervals after emergence. Yield was assessed by weight of the garlic at harvest time, 29th April, from each plot. Recording seedlings number and yield assessment were conducted at 5 random 40 cm rows and the mean for each plot calculated.

The data were analyzed with MSTATC software and the means of treatments effects on seedling no. and yield were compared by Duncan test.

RESULTS AND DISCUSSION

The results showed that there were no significant differences between seedling numbers in various dates through growing season but there were significant differences between yields affected by different treatments (Table 1).

Whereas there were no significant differences among seedlings number, the highest number related to Carbaryl 4 g/ Lit treatment and powder seed coating in

rate of 2 g/kg of garlic seed and control located in lower levels respectively (Fig. 1). Since the decrease of plant numbers during the vegetative and bulbing stages, the most slump was observed in early growth stage which is in agreement with Gailite (2002) and Mohiseni (2002) studies, which indicated the most damage of garlic fly related to new growth seedlings and the damage of autumn generation is higher than the spring one.

The means comparison of yield illustrated significant difference between Carbaryl 4 g/ Lit treatment and control with 51750 kg/ha and 34320 kg/ha amounts respectively (Fig. 2). There were no significant differences between Carbaryl 4 g/ Lit and 2 g/kg of garlic seed treatments and also Carbaryl 2 g/kg of garlic seed treatment and control.

The results indicated that the seed treatment with Carbaryl 4 g/ Lit solution causes good and complete pesticide coating against garlic fly attack and increased yield about 50.78% in comparison to the control but the treatment with Carbaryl powder in rate of 2 g/kg of garlic seed gave moderate control with 43440 kg/ha yield.

Narkiewicz-Jodko (1988) by studies on garlic fly in Poland reported that there was one generation of this species per year and up to 70% of plants were damaged in 1985 and 1986. Effective control was achieved by applying insecticides as granules or sprays during the oviposition period. Diazinon 25% EC and 10% G at 1.5 litre/ha and 1 g/m of row, Triazophos 40% EC and 5% G at 1 litre/ha and 2 g/m of row, Isofenphos 5% G at 2 g/1 m of row, and Fonofos 5% G at 2 g/m of row gave effective control. Similar investigations showed that seed with Diflubenzuron, Fipronil, Imidacloprid and Teflubenzuron gave good control, whereas coating with Benfuracarb and Methiocarb was only moderately effective. The accomplished studies introduced that pre-sowing seed dressing is the best and a precise control method to protect the seeds in their early growth (Emmett and Savage, 2007, Ester, 1999 and Narkiewicz-Jodko, 1988). Since the chlorate pesticides are accumulated in environment and also in alive organisms, seed coating with suitable carbamates like Carbaryl as a good alternative is recommended (Nkedi-Kizza and Brown, 1998).

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Table 1. Analysis of variance (ANOVA) of Carbaryl seed treatment on number of garlic seedlings and yield.

Source	df	Ms				
		Seedling No.				Yeild
		25th December	30th January	4th March	29th April	
Treatment	2	0.618ns	0.791ns	2.618ns	2.804ns	0.253*
Error	4	0.811	1.731	3.278	1.651	0.034
CV		7.56	8.39	10.28	11.93	8.59

ns No significant difference, * Significant difference at 5% probability

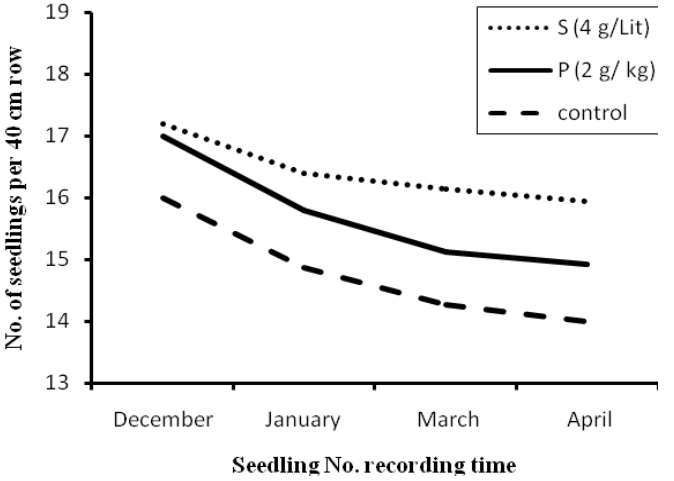

Figure 1. Means of seedlings number in various dates affected by different Carbaryl seed treatments.

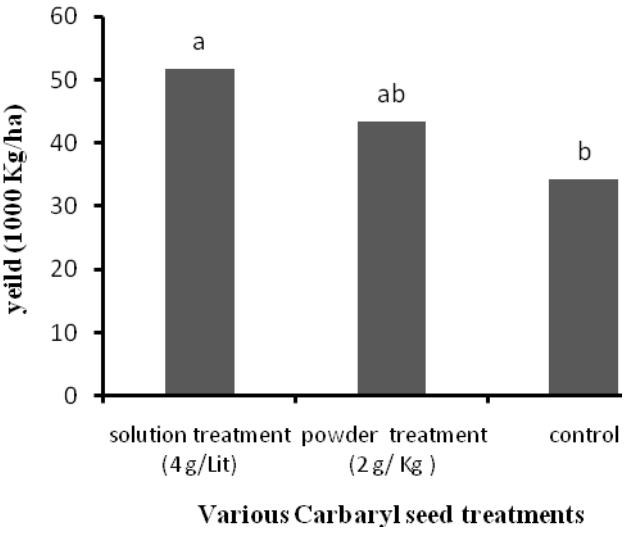

Figure 2. Means of garlic yield affected by various Carbaryl seed treatments.