RESULTS AND DISCUSSION

Lethal effect of eight pesticides

Results of acute toxicity assay of eight pesticides are presented in Fig. 1 and Table 2. Fenitrothion were highly toxic to adult *O. nezarae* and wasp's mortality reached 100% in 8 hours from topical application and exposure to residue. LT_{50} of insecticides including spinosad, thiamethoxam, etofenprox, cyfluthrin, and carbosulfan, significantly lower than that of s-metolachlor or metalaxyl regardless of exposure methods (Table 2). Fenitrothion is a broad-spectrum insecticide and known to cause high acute toxicity to natural enemies (Flint and Dreistadt, 1998).

O. nezarae were also highly susceptible to neonicotinoid thiamethoxam in all the assay. In other study by Preetha et al. (2009), thiamethoxam was the most toxic against *Trichogramma chilonis* in residual bioassay. All and Treacy (2006) classified thiamethoxam as a insecticide causing moderate toxicity (31-70% reduction) on parasitic wasps and high toxicity (> 70%) in hemipteran and neuropteran natural enemies. However, in previous studies, thiamethoxam showed lower toxicity on predatory mites based on the residual-contact bioassay (Poletti et al., 2007) and on *Trissolcus nigripedius* Nakagawa, a parasitoid of *Dolycoris baccarum* L. in the assay of both topical application and exposure to residue (Lim and Mahmoud, 2008).

Spinosad and carbosulfan pesticides showed acute toxicity to *O. nezarae*. Spinosad, actinomycete product, is known as a very effective as contact and stomach poison. All and Treacy (2006) reported that direct spray of spinosad was highly toxic to beneficial insects and

little hazard after drying. Carbamate insecticides cause rapid and strong toxic effect on natural enemies (Ulmer et al., 2006; Carrillo et al., 2009). The herbicide s-metolachlor and the fungicide

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The results from the acute toxicity assay for eight pesticides are presented in Fig. 1 and Table 2. Fenitrothion was highly toxic to adults of *O. nezarae* and mortality reached 100% within 8 hours from topical application or exposure to surface residues. The LT_{50}s of spinosad, thiamethoxam, etofenprox, cyfluthrin, and carbosulfan were significantly lower than those of s-metolachlor or metalaxyl, regardless of exposure methods (Table 2). Fenitrothion is a broad-spectrum insecticide and is known to be highly toxic to many species of natural enemies (Flint and Dreistadt, 1998).

O. nezarae was also highly susceptible to the neonicotinoid thiamethoxamin all the assays. In another study, Preetha et al. (2009)found thiamethoxam to be the mosttoxic compound tested to *Trichogramma chilonis* in a surface residue bioassay. All and Treacy (2006) classified thiamethoxam as an insecticide with moderate toxicity (31-70% reduction) to parasitic wasps and high toxicity (> 70%) to predatory Hemiptera and Neuroptera. In contrast, thiamethoxam showed much lower toxicity to predatory mites in a residual-contact bioassay (Poletti et al., 2007), and to the parasite *Trissolcus nigripedius* Nakagawa in topical application and residual-contact bioassays (Lim and Mahmoud, 2008).

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Both spinosad and carbosulfan pesticides were highly toxic to *O. nezarae*. Spinosad, an actinomycete product, is known to be a very effective contact or stomach poison. All and Treacy (2006) reported that a direct application of spinosad to beneficial insects caused high mortality, but after drying, residues posed little hazard. The high toxicity of carbosulfan is consistent with the fact that carbamate insecticides generally have a rapid and strongly toxic effect on natural enemies (Ulmer et al., 2006; Carrillo et al., 2009). The herbicide s-metolachlor and the fungicide metaxalyl were

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thiamethoxam as an insecticide with moderate toxicity (31-70% reduction) to parasitic wasps and high toxicity (> 70%) to predatory Hemiptera and Neuroptera. In contrast, thiamethoxam showed much lower toxicity to predatory mites in a residual-contact bioassay (Poletti et al., 2007), and to the parasite *Trissolcus nigripedius* Nakagawa in topical application and residual-contact bioassays (Lim and Mahmoud, 2008).

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