

Imidakloprid merupakan insektisida neonicotinoid yang digunakan untuk mengendalikan wereng cokelat, *Nilaparvata lugens*. Penelitian ini bertujuan untuk mengetahui tingkat resistensi, efek sinergis, kebugaran relatif, kapasitas makan, dan perkembangan *N. lugens* resisten yang dipapar imidakloprid. Seleksi laboratorium *N. lugens* meningkat tingkat resistensi 50,64 kali dibandingkan dengan populasi peka. Populasi *N. lugens* dari wilayah Banyumas dan Cilacap tingkat resistensi masing-masing 27,71 dan 29,37 kali. Penambahan tiga sinergis, PBO (*piperonyl butoksida*), DEM (*Diethyl maleate*), dan DEF (*s, s, s-tributylphosphorotrithioate*) dengan rasio 1 : 4 menghasilkan efek sinergis dengan nilai rasio sinergisme masing-masing 8.61, 4.29, dan 3,25 kali. Jika populasi *N. lugens* yang resisten dan peka tidak dipapar dengan imidakloprid, maka populasi peka mempunyai kebugaran lebih baik daripada populasi resisten, dan kebugaran dari populasi *N. lugens* yang resisten akan meningkat ketika dipapar dengan imidakloprid konsentrasi subletal ( $LC_{50}$  &  $LC_{20}$ ). Peningkatan kebugaran populasi *N. lugens* resisten diduga terkait dengan peningkatan kemampuan makan akibat dipapar lagi dengan imidakloprid subletal. Terjadi peningkatan yang signifikan terhadap keperidian pada koloni *N. lugens* resisten yang dipapar imidakloprid (400 butir telur/betina) dibandingkan koloni *N. lugens* resisten yang tidak dipapar (202 butir telur/betina). Selanjutnya, 95,75% telur yang dihasilkan oleh betina yang diperlakukan menetas, dan telur yang dihasilkan oleh betina yang tidak dipapar mempunyai tingkat/persentase penetasan yang lebih rendah (89,64%). Jumlah keturunan yang dihasilkan oleh 10 pasang *N. lugens* resisten yang dipapar imidakloprid selama tiga generasi juga dua kali lebih tinggi (1002 nimfa) dibandingkan dengan populasi resisten tidak dipapar (501 nimfa). Meskipun terjadi peningkatan keperidian dan tingkat penetasan dari *N. lugens* resisten yang dipapar dengan imidakloprid, namun hasil ini masih lebih rendah daripada keperidian dan tingkat penetasan dari *N. lugens* peka (852 telur /betina dan 97,97%). Hasil penelitian ini menunjukkan bahwa PBO adalah sinergis yang paling efektif menurunkan  $LC_{50}$  populasi resisten yaitu 3,94 ppm. Diduga sitokrom P450 monooxygenases sebagai enzim yang berperan dalam mekanisme resisten *N. lugens* terhadap imidakloprid. Imidakloprid meningkatkan fekunditas *N. lugens* resisten. Ledakan *N. lugens* akan terjadi, apabila populasi *N. lugens* yang telah resisten terhadap imidakloprid dipapar lagi dengan imidakloprid.

**Kata kunci:** *Nilaparvata lugens*, imidakloprid, resistensi, sinergisme, kebugaran relatif dan kapasitas makan, perkembangan populasi

*Imidacloprid is a neonicotinoid insecticide and used to control the brown planthopper, Nilaparvata lugens. This research was aimed to develop and determine the resistance level, effects of synergists, relative fitness, feeding capacity, and population growth of imidacloprid resistant N. lugens. The laboratory selection of N. lugens increased the resistance level to 50.64 times compared to the susceptible population. Field collected populations from Banyumas and Cilacap Districts exhibited the resistance level of 27.71 and 29.37 times, respectively. The addition of three synergists, PBO (Piperonyl butoxide), DEM (Diethyl maleate), and DEF (s,s,s-tributylphosphorotrithioate) with 1:4 ratio resulted synergistic effects with synergism ratio values of 8.61, 4.29, and 3.25, respectively. The aim of this study was to determine the fitness and feeding capacity of imidacloprid-resistant N. lugens. When the resistant and susceptible population of N. lugens did not receive any exposure to imidacloprid, the susceptible population had better fitness than the resistance one. However, the fitness of the resistant population increased when this population was exposed to sublethal concentrations ( $LC_{50}$  &  $LC_{20}$ ) of imidacloprid. The increase in fitness of this resistant population most likely related to the increase in feeding capacity of the resistant population when they were treated with sublethal concentrations. The objective of this study was to determine the effect of imidacloprid on population growth of imidacloprid resistant N. lugens. A significant increase in the fecundity resistant were observed in the resistant colonies imidacloprid (400 eggs / female) than that of the untreated resistant colonies (202 eggs / female). Furthermore, 95.75% eggs produced by the treated females hatched and the eggs produced by the untreated females had a lower hatching rate (89.64%). The number of progeny produced by 10 pairs of the resistant population exposed to imidacloprid for three generation was two times higher (1002 nymphs) than that of the untreated resistant population (501 nymphs). Although there was an increase in the fecundity and hatching rate of the resistant N. lugens treated with imidacloprid, those were still lower than the fecundity and hatching rate of the susceptible N. lugens (852 eggs/female and 97.97% of hatching). These findings suggest that the PBO was the most effective synergist to reduce  $LC_{50}$  of resistant population to 3.94 ppm. These results may suggest the contribution of cytochrome P450 monooxygenases as important enzyme in N. lugens resistant mechanism to imidacloprid. Imidacloprid is also increasing fecundity N. lugens of resistance. These findings suggest that the field population of N. lugens have developed resistance would increase the probability of outbreak if they were sprayed with imidacloprid.*

**Key words:** *Nilaparvata lugens, imidacloprid, resistance, synergism, relative fitness and feeding capacity, population develop*



**Resistensi terhadap Imidakloprid Sebagai Salah Satu Faktor Penyebab Ledakan Populasi Wereng Batang**

**Padi Cokelat (*Nilaparvata lugens*)**

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