PEMANFAATAN VIRUS SIMBION DARI BEBERAPA SPESIES PARASITOID UNTUK MENINGKATKAN KINERJA *ERIBORUS ARGENTEOPILOSUS* (CAMERON) (HYMENOPTERA: ICHNEUMONIDAE) DALAM MENGENDALIKAN *CROCIDOLOMIA BINOTALIS* ZELLER (LEPIDOPTERA: PYRALIDAE)

ABSTRAK

Polidnavirus (PDV) simbion berada dalam jaringan reproduksi serangga betina parasitoid Ichneumonidae dan Braconidae. PDV simbion diperoleh dari ekstrak ovari parasitoid *Apanteles spp.* serta ekstrak jaringan larva inang *Spodoptera litura* (Fabricius) terparasit oleh *Snellenius manilae* Ashmead dan diidentifikasi melalui metode pengecatan negatif. Morfologi ultrastruktur PDV yang berasal dari jaringan kaliks parasitoid *Diadegma semiclausum* Helen (Famili: Ichneumonidae) dicirikan dengan nukleokapsid berbentuk membulat yang dikelilingi oleh dua lapis membran ganda, berbeda dengan PDV berasal dari jaringan kaliks parasitoid *S. manilae* (Famili: Braconidae) dicirikan dengan nukleokapsid berbentuk silindris, terpisah secara individu atau bergabung di dalam kelompok yang dikelilingi oleh satu lapis membran ganda. Ekstraksi dan sentrifugasi ovari parasitoid serta cairan jaringan larva terparasit yang diperoleh dengan prosedur pemisahan larutan sukrosa berlapis membuktikan adanya endapan PDV yang berasal dari empat spesies parasitoid *Eriborus argenteopilosus* (Cameron) dan *D. semiclausum* (Famili: Ichneumonidae), serta *S. manilae* dan *Apanteles spp.* (Famili: Braconidae). Melalui pengujian serologi, setiap antigen (Ag PDV) tersebut menunjukkan reaksi yang kompatibel terhadap masing-masing antibodi (Ab) hasil reaksi yang dibentuknya.

Kemampuan inang *Crocidolomia binotalis* Zeller dalam mengenkapsulasi telur parasitoid *E. argenteopilosus* berkaitan dengan reaksi imunitas negatif oleh Ab (terbentuk karena respon keberadaan PDV) terhadap Ag PDV yang diisolasi dari darah inang terparasit. Keadaan sebaliknya terjadi pada inang *S. litura* yaitu tidak berhasilnya enkapsulasi telur *E. argenteopilosus* maupun *S. manilae* dapat dihubungkan dengan adanya reaksi imunitas positif dari Ab terhadap PDVdengan Ag PDV.

Parasitoid *E. argenteopilosus* tidak selalu mendepositkan telur dalam tubuh inangnya. Telur yang diletakkan rata-rata berkisar 66%-87% dari seluruh kegiatan oviposisinya. Larva *C. binotalis* merupakan inang yang paling tidak sesuai bagi perkembangan parasitoid *E. argenteopilosus* dibandingkan berturut-turut dengan larva *Helicoverpa armigera* (Hubner) dan *S. litura*. Rata-rata persentase telur yang diletakkan tertinggi pada larva inang instar II *H. armigera* (82,5%) dan terendah pada *C. binotalis* (72%) dan *S. litura* (69,9%). Persentase enkapsulasi parasitoid tertinggi pada inang *C. binotalis* (61,5%) dan terendah pada inang *S. litura* (5,8%) dan *H. armigera* (4%). Keberhasilan hidup parasitoid tertinggi pada larva inang *S. litura* (41%) diikuti inang *H. armigera* (34%) dan terendah pada inang *C. binotalis* (8%). Rendahnya keberhasilan hidup parasitoid diduga berkaitan erat dengan tingginya enkapsulasi telur dan larva di dalam tubuh inang.

Pemarasitan oleh parasitoid *E. argenteopilosus* mengakibatkan bertambahnya jumlah hemosit total larva inang *C. binotalis* maupun *S. litura*. Rata-rata jumlah hemosit total larva *C. binotalis* pada hari ke lima setelah terparasit nyata lebih banyak sebesar $75,5x10^3$ mm^3 dibandingkan dengan jumlah hemosit pada larva *S. litura* pada hari yang sama sebesar $42,9x10^3$ mm^3. Pertambahan sel hemosit inang *C. binotalis* diduga berkaitan erat dengan kegiatan enkapsulasi telur dan larva parasitoid *E. argenteopilosus*.

Parasitoid *S. manilae* aktif meletakkan telur pada pagi hari saat pukul 06.00-10.00 yaitu berkisar antara 6-9 telur/betina/2 jam pemaparan. Telur parasitoid *S. manilae* paling banyak diletakkan pada larva inang *S. litura* instar III (20 telur/betina/2 jam pemaparan) dan instar III (17 telur/betina/2 jam pemaparan) berbeda dibandingkan dengan instar lainnya. Bila pemaparan seluruh instar (I sampai V) terhadap parasitoid dilakukan bersama-sama di dalam satu kurungan, maka larva instar III merupakan larva terpilih sebagai media peletakkan telur parasitoid (13 telur/betina/2 jam pemaparan). Larva instar II merupakan instar yang paling sesuai untuk perkembangan parasitoid yaitu sebesar 16% bila dibandingkan dengan instar lainnya.

Multiparasitisme *E. argenteopilosus* dan *S. manilae* pada inang *S. litura* dengan selang waktu 24 jam menunjukkan rata-rata keberhasilan hidup parasitoid lebih tinggi yaitu masing-masing 4% dan 9% dibandingkan dengan parasitisme tunggal sebesar 1% dan 6%. Walaupun persentase keberhasilan

hidup parasitoid tersebut belum mencapai nilai yang maksimal, rekayasa multiparasitisme relatif tidak menunjukkan penurunan kebugaran parasitoid dibandingkan dengan parasitisme tunggal.

Kata Kunci: Polidnavirus (PDV) simbion, parasitoid, *Eriborus argenteopilosus, Diadegma semiclausum, Snellenius manilae, Apanteles spp.*, Ichneumonidae, Braconidae, ultrastruktur, imunitas, hemosit, multiparasitisme, kebugaran.

ABSTRACT

Polydnaviruses (PDV) are present in the female reproductive tissues of parasitoid Ichneumonids and Braconids. PDV symbionts were extracted from the ovaries of the parasitoid *Apanteles spp.* and host larval tissues of *Spodoptera litura* (Fabricius) attacked by parasitoid *Snellenius manilae* Ashmead and identified using the negative staining methods. The ultrasructure appearance of PDV derived from the calyx of parasitoid *Diadegma semiclausum* Helen (Family: Ichneumonidae) tissues are determined by the presence of nucleocapsid elliptical surrounded by double bilayer membranes. PDV derived from parasitoid *S. manilae* (Family: Braconidae) have nucleocapsid that are cylindrical, individually or in groups surrounded by single bilayer membranes. The extraction and centrifugation of ovary parasitoid and infected host larval tissues by parasitoid obtained through the sucrose gradient procedure produced PDV sediment originated from four spesies such as *Eriborus argenteopilosus* (Cameron) and *D. semiclausum* (Family: Ichneumonidae) as well as *S. manilae* and *Apanteles spp.* (Family: Braconidae). Immunological methods that followed showed that each antigens (Ag PDV) are compatible against their antibodies (Abs) were produced.

The capability of *Crocidolomia binotalis* Zeller to encapsulate the parasitoid eggs of *E. argenteopilosus* is correlated with the negative immunological respons of Ab induced by PDV against Ag PDV which were isolated from the hemolymph of infected larval host. On the contrary, the failure of the encapsulation of *E. argenteopilosus* as well as *S. manilae* eggs were caused by the positif immunological reaction between those Ab induced by PDV and Ag PDV.

The parasitoid *E. argenteopilosus* does not fully lay her eggs inside each host. Eggs were deposited between 66%-87% from whole oviposition activity. Larvae of *C. binotalis* were unsuitable host for the development of parasitoid *E. argenteopilosus* compared with other hosts *Helicoverpa armigera* (Hubner) and *S. litura*. The average of eggs were deposited were the highest in the second instar larval hosts of *H. armigera* (82.5%) and the lowest in both hosts *C. binotalis* (72%) and *S. litura* (69%). The percentage of eggs encapsulation was the highest in the host *C. binotalis* (61.5%) and the lowest in both host *S. litura* (5.8%) and *H. armigera* (4%). The highest survivability of parasitoids was found in the larval host *S. litura* (41%) followed by *H. armigera* (34%) and the lowest was in *C. binotalis* (8%).

Parasitism of *E. argenteopilosus* effect on an increased the number of total haemocytes larval host *C. binotalis* as well as *S. litura*. The average number of total haemocytes of larval host *C. binotalis* was $75.5x10^3$ mm^3 biggest compared with the total haemocytes of larval host *S. litura* was $42.9x10^3$ mm^3. Those increased haemocytes number in the larval host *C. binotalis* was coincident with the processing of eggs and larval parasitoids *E. argenteopilosus* encapsulation.

Parasitoid *S. manilae* was actively laying her eggs at 06.00-10.00 a.m. between 6-9 eggs/female/2 hours exposure. The highest eggs numbers were deposited in both the second and the third larval host *S. litura* which were 20 eggs/female/2 hours exposure and 17 eggs/female/2 hours exposure compared with the other instars. If the exposure of parasitoids was applied together (including first to fifth larval instars) within one cage, the third instar larva was the unsuitable host for oviposition (13 eggs/female/2 hours exposure).

The average of survivability percentages of parasitoid applied by multiparasitism of *E. argenteopilosus* followed by *S. manilae* after 24 hours of the first exposure in the larval host *S. litura* showed the higher value were consecutively 4% and 9% compared with single parasitism were 1% and 6%. Although the survival of parasitoids did not reach the maximum value, multiparasitism effect do not suppress their fitness.

Key Words: Polydnaviruses (PDV) symbiont, parasitoid, *Eriborus argenteopilosus, Diadegma semiclausum, Snellenius manilae, Apanteles spp.*, Ichneumonidae, Braconidae, ultrasructure, immunological, hemocytes, multiparasitism, fitness.