

## DETECTION SURVEY OF KHAPRA BEETLE IN STORED AGRICULTURAL PRODUCTS IN CENTRAL JAVA

### *SURVEI DETEKSI KUMBANG KHAPRA DI GUDANG PRODUK PERTANIAN DI JAWA TENGAH*

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#### ABSTRACT

Khaphra beetle, *Trogoderma granarium* Evert (Coleoptera: Dermestidae) entered Central Java together with importation of stored products four decades ago. A survey was conducted to detect whether the Kaphra beetle existed in Central Java after they had been fumigated during commodity arrival. If the Kaphra beetle is absent, the data could be treated as the starting point toward declaring a pest free area (PFA) of Kaphra beetle in Central Java. The survey employed the procedure established in Australia, except this survey lasted for 11 months starting from April 2008 to February 2009. Insect traps (Trécé Incorporation, Oklahoma, USA) were placed in eight sites distributed in six districts identified as high risk for Kaphra beetle. The traps were substituted following the label. The traps were checked every 2–4 weeks making the total observations varying from 18–24 times, except one site (eight times). No Kaphra beetle was observed during this detection survey. This finding strongly suggests that Kaphra beetle is not present in Central Java. Survey should be continued to collect data sufficient to declare PFA of Kaphra beetle.

Key words: detection survey, Kaphra beetle, trap

#### INTISARI

*Kumbang Khaphra, Trogoderma granarium Evert (Coleoptera; Dermestidae) masuk ke Jawa Tengah bersama sama dengan produk impor empat dekade lalu. Survei deteksi ini dilakukan untuk mendeteksi apakah kumbang Kaphra masih ada di Jawa Tengah setelah dilakukan fumigasi sejak kedatangannya. Jika kumbang Kaphra sudah tidak ada, data tersebut digunakan sebagai langkah awal penetapan area bebas hama (Pest Free Area/PFA) kumbang Kaphra di Jawa Tengah. Survei menggunakan prosedur yang telah ditetapkan di Australia, yang dilakukan selama 11 bulan mulai April 2008 hingga Februari 2009. Perangkap serangga (produk dari Trécé Incorporation, Oklahoma, USA) diletakkan di delapan tempat yang tersebar di enam Kabupaten/kota yang diidentifikasi sebagai daerah berisiko tinggi terhadap keberadaan kumbang Kaphra. Perangkap diganti dengan interval waktu dua bulan, dan diamati setiap 2–4 minggu. Jumlah observasi mencapai kisaran 18–24 kali, kecuali di satu gudang (delapan kali). Kumbang Kaphra tidak ditemukan selama survei deteksi berlangsung. Hasil ini menunjukkan bahwa kumbang Kaphra tidak ada di Jawa Tengah. Survei perlu dilanjutkan untuk memperoleh data samapai memenuhi untuk persyaratan penetapan PFA.*

*Kata kunci: kumbang khaphra, perangkap, survei deteksi*

#### INTRODUCTION

Khaphra beetle (*Trogoderma granarium* Everts; Coleoptera: Dermestidae) is one of serious pests for stored products worldwide. Movement of Khaphra beetle is facilitated by international trading, particularly through the entrance of infested goods or containers (CABI, 2006). Considering its wide geographical distribution and host range, this insect pest, therefore, has become a species of quarantine concern in many countries. Several countries, such as USA, Australia, New Zealand, China,

Kenya, Tanzania, Malaysia, and Thailand, have implemented specific quarantine regulations to protect their country from the introduction of Khaphra beetle (Sommerfields, 1981; CABI, 2006; Sayed *et al.*, 2006).

Khaphra beetle is very destructive under hot and dry climate (Sommerfield, 1981). The optimum temperature for its development is at 35°C (Burgess, 2006). Larvae enter diapause if the environmental condition is unfavorable, such as when temperature is below 20°C (CABI, 2006). The temperature

required for optimum development of Khapra beetle is not far from the average temperature in Indonesia. Therefore, this insect will most likely establish if it arrives and spreads in Indonesia.

In Indonesia, Khapra beetle was first time found in the products coming through some ports in Sumatera, South Sulawesi, Special District Capital of Jakarta, Central Java, East Java, East Nusa Tenggara, and West Nusa Tenggara (NTB) (Basri *et al.*, 1977). Immediately, a quarantine procedure by fumigation was employed to eradicate this insect. However, surveillance following the fumigation was not conducted so far. Therefore, it was not known whether or not Khapra beetle was completely eradicated. It could be that this insect might have been established in some regions in Indonesia. Since the first introduction in 1970, there was no information documenting the presence of Khapra beetle in Indonesia. Lack of information is mainly due to lack of systematic surveillance activities to monitor this insect. Therefore, monitoring procedure is needed to confirm the absence of this beetle. If the monitoring data confirms its absence, it is feasible for Indonesia to declare a Khapra Beetle Pest Free Area (PFA) after all requirements as written in ISPM 4 are fulfilled (FAO, 1996). Being free from Kaphra beetle will have some benefits in international trading, particularly related with grain products.

Central Java is one of the central production areas of some grains, and in 1970s this province was one amongst several that was reported to receive products infested with Kaphra beetle. Therefore, a detection survey was conducted to confirm the absence of this insect in Central Java, and start data basing for the purpose of establishing PFA.

## MATERIALS AND METHODS

### *Location of Survey*

Based on the historical data described above and current condition related with export import activities in the Province of Central Java, eight sites distributed in six districts were selected. The observation sites were warehouses storing grain products. In each district, one warehouse was chosen, except the districts of Semarang with three warehouses. Semarang and Pati were the districts reported to receive infestation of Kaphra beetle, and Semarang has more sites because traffic of the grain products was more intensive than in other districts. Kendal and Sragen were selected as a buffer zone because they are adjacent to the point of infestation. Sukoharjo represented a district with no report of

Kaphra beetle, rice production area, and was located far from the point of infestation. The sixth district was Temanggung where wood packaging materials for export of grains was originated from.

### *Condition of Warehouses*

The selected warehouses were observed for the type of commodity, and the condition of package and pallet. Sanitation and all activities intended for maintaining the product quality were collected through interview with the employees. Furthermore, the temperature and relative humidity in two warehouses in Semarang were recorded, starting in November 2008 until January 2009 with interval of two or three days.

### *Surveillance*

Survey of Kaphra beetle was carried out using visual observation and traps. Visual observation was intended to check on the area of warehouse where Kaphra beetle would most likely be present if any. The use of trap for survey of this insect has been commonly practiced in other countries.

**The trap.** The survey employed the procedure established in Australia (McMaugh, 2007) and it was modified slightly for Indonesian conditions. Since Indonesia has a warmer climate than countries with four distinct seasons in a year, it was assumed that Kaphra beetle is active the whole year. Therefore, continuous detection within a year was carried out. The dome traps containing both sex pheromone and food attractant (STORGARD®, Trécé Incorporated, Oklahoma, USA) were used for this detection survey. This trap has been used in several other countries, such as Australia, New Zealand, Brazil, and Saudi Arabia. These countries are not the origin of Khapra beetle. The trap can attract insect from the distance of 5 km. Sex pheromone used together with food attractant was more effective than when they were used individually. The pheromone attracts male insects and the food attractant is effective for male and female adults as well as larvae (Cox, 2004).

**Placement of the traps.** Three to five traps, depending on the size of the warehouse and the amount of grain products, were placed in each warehouse, and they were distributed systematically surrounding the stored products. The traps were on the floor and hung 1 m high to insure that there is no disturbance for the warehouse activities and to ease of observation. The traps were substituted every two months with a total of five substitutions for each site during 11 months of data collection. The total traps used in all districts during the survey were 30 pieces.

### Observation

The traps were checked every 2–4 weeks, and the warehouses in the high risk areas received more intensive observations. The trapped insects were collected for identification and counting. The number of observation varied from 18–24 times during the period of survey (11 months), except for Temanggung with eight observations only. The least number of observations was in the District of Temanggung and the most intensive observation was in the District of Semarang. The collected insects were brought to the laboratory for identification the presence of Kaphra beetle if any.

## RESULTS AND DISCUSSION

### Condition of Warehouses

The condition of warehouses varied from poor to excellent aeration, soil to concrete floor, and dark to enough light. The floor made of cement or tile was in a good shape with little number of cracks. Based on the data collected from Semarang, the temperature ranged 22–38°C with relative humidity of 65–92%. The most warehouses were maintained sufficiently well. They were clean, sanitized periodically, and fumigated once every six months. The warehouses used to store local agricultural products, such as rice, were less maintained than

those to store the imported ones. The imported agricultural commodities found during the period of survey were peanut, soy bean, maize, green bean, wheat, and garlic (Table 1). This microclimate and availability of varied variety of hosts assure that Kaphra beetle would have not been in the diapauses stage if they were present.

### Surveillance

Visual observation and traps did not record the presence of Kaphra beetle (Table 2). The trap was effective in attracting the insect usually live in the warehouse as it showed by the high number of insect specimens trapped (1,406 specimens) during the period of survey. The same trap was reported effective in detecting the presence of Kaphra beetle together with the imported commodity coming to USA (French and Vennette, 2005), Lithuania, China and Saudi Arabia (CABI, 2006).

The warehouses were frequently inspected, ranging from 18–24 times during 11 months, except for Temanggung (8 times). This increases our confidence that the absence of Kaphra beetle was not by chance due to ‘escape’ from the observations, but it was the real fact. The microclimate of the warehouses also support the assumption that Kaphra beetle should be in active stage if they were present. Systematic and intensive surveillance were not done

Table 1. Selected warehouses in Central Java used for detection survey of Kaphra beetle from April 2008 to February 2009

| No. | District   | Warehouse                | Commodities present <sup>a</sup>                            |
|-----|------------|--------------------------|---|
| 1.  | Semarang   | PT Wahana Baru           | Garlic, peanut, and green bean                              |
|     |            | PT Charoen Poekpand      | Soybean meal, rapeseed meal, and feed for livestock (maize) |
|     |            | PT Gerbang Cahaya        | Soybean   |
| 2.  | Kendal     | Gudang Beras Sumber Rejo | Rice  |
| 3.  | Pati       | PT Garuda Food           | Peanut  |
| 4.  | Sragen     | PT Tiga Pilar            | Rice and wheat  |
| 5.  | Sukoharjo  | PT Tiga Pilar            | Rice flour  |
| 6.  | Temanggung | PT Albhasia Bumi Pala    | Wood materials for packing                                  |

<sup>a</sup> All were imported products, except for rice, rice flour, and wood materials.

Table 2. Surveillance of Kaphra beetle in Central Java from April 2008 to February 2009 <sup>a</sup>

| No. | District   | Warehouse                | No. Traps | No. Observations | Population per trap |
|-----|------------|--------------------------|-----------|------------------|---------------------|
| 1.  | Semarang   | PT Wahana Baru           | 4         | 24               | Absent              |
|     |            | PT Charoen Poekpand      | 4         | 20               | Absent              |
|     |            | PT Gerbang Cahaya        | 5         | 18               | Absent              |
| 2.  | Kendal     | Gudang Beras Sumber Rejo | 3         | 21               | Absent              |
| 3.  | Pati       | PT Garuda Food           | 4         | 18               | Absent              |
| 4.  | Sragen     | PT Tiga Pilar            | 4         | 21               | Absent              |
| 5.  | Sukoharjo  | PT Tiga Pilar            | 3         | 21               | Absent              |
| 6.  | Temanggung | PT Albhasia Bumi Pala    | 3         | 8                | Absent              |

<sup>a</sup> Survey employed STORGARD<sup>®</sup> containing pheromone and food attractant.

before; however, quarantine officers did monitoring Kaphra beetle and the existence of this beetle was not reported after its arrival in Central Java four decades ago. This suggests that the quarantine treatment by fumigation at its arrival effectively eradicated this beetle.

The absence of Kaphra beetle in Central Java could be used as a starting point toward the declaration of PFA. Continuous surveillance is needed to comply with ISPM 4. Acceptance on the status of Kaphra beetle PFA would provide benefit for Central Java in export-import of agricultural products to and from this province. In term of receiving commodity, the government must require the certificate of free from Kaphra beetle. On the other hand, when export is the expectation the potential receiving country should have confidence of not being introduced by this beetle. These mean that the bargaining power of Central Java in the international market would increase.

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