

CONTROL OF CACAO POD BORER, *CONOPOMORPHA CRAMERELLA* SNELLEN ON CACAO PLANTATIONS IN NORTH SULAWESI USING DEGRADABLE POLYMER SLEEVES

PENGENDALIAN PENGGEREK BUAH KAKAO, *CONOPOMORPHA CRAMERELLA* SNELLEN PADA PERKEBUNAN KAKAO DI SULAWESI UTARA DENGAN MENGGUNAKAN PLASTIK POLIMER

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ABSTRACT

Research was aiming to control the cocoa pod borer, *Conopomorpha cramerella* using different thickness of degradable plastic and regular plastic by sleeving to protect pods. The studies were carried out in abandoned cacao plantation at Sapa, and commercial cacao plantations at Pungkol in the sub-district of South Minahasa in North Sulawesi, Indonesia.

Result showed that sleeving with plastic at different thickness can reduce markedly the infestation by CPB but there was no significant difference between thickness and type of plastic. Between 85 to 95 % of the pods sleeved with degradable and non- degradable plastic at the commercial cacao plantation were not damaged by CPB but 96 % of control (unsleeved pods) was damaged by CPB.

Key words: *Conopomorpha cramerella*, *cocoa plantations*, *degradable plastic bags*

ABSTRAK

Penelitian telah dilakukan untuk mengendalikan hama penggerek buah kakao (PBK), *Conopomorpha cramerella* dengan menggunakan kantong plastic dengan ketebalan yang berbeda yang dapat terurai dalam tanah dengan ketebalan kantong plastik yang berbeda dan plastik biasa untuk memproteksi buah kakao. Penelitian ini telah dilakukan di perkebunan kakao yang tidak terawat di Sapa dan di perkebunan kakao komersial di Pungkol, Kabupaten Minahasa Selatan, Sulawesi Utara, Indonesia.

Hasil penelitian menunjukkan bahwa pembungkusan dengan plastik dapat menurunkan secara nyata infestasi dari penggerek buah kakao tapi tidak terdapat perbedaan yang nyata diantara ketebalan plastik namun berbeda sangat nyata antara penyarungan dengan tanpa penyarungan. Antara 85 sampai dengan 95 % dari buah yang disarung dengan plastik yang dapat terurai dan yang tidak dapat terurai di perkebunan komersial tidak dirusak oleh PBK tapi 96 % dari kontrol (tidak disarung plastik) dirusak oleh PBK. Tidak ada perbedaan yang nyata diantara ketebalan plastik.

Kata Kunci : *Conopomorpha cramerella*, *perkebunan kakao*, *kantong plastik yang dapat terurai*

BACKGROUND

Cacao, *Theobroma cacao* L., was first introduced by the Portuguese to North Sulawesi as early as seventeenth century and then spread to Java and the Moluccas during the early eighteenth century (Van der Knaap, 1953 cited by Soenaryo and Situmorang, S. 1978). Cocoa plantations were then developed in North Sulawesi as an important industrial crop until it was seriously damaged by the cocoa pod borer (CPB), *Conopomorpha cramerella* (Snellen), in early 1940s, a pest known to be indigenous to this area. Since then efforts to develop the cacao industry in North Sulawesi had always been limited by serious attacks of the cacao pod borer.

In 1985, the provincial government launched a program to redevelop cacao as an important industrial crop after an eradication program on CPB which was started in early 1980s. Eradication program for CPB was carried out on old cocoa plantations in North Sulawesi during 1984-1985 by cutting all old cocoa trees. Three years later in 1988, a field survey was carried out to study the presence of CPB in North Sulawesi and there was no CPB found on cocoa plantations in North Sulawesi (Sembel & Team, 1989).

Survey which carried out on cacao plantations in the districts of South Bolaang Mongondow, North Bolaang Mongondow and South Minahasa in the Province of North Sulawesi and in the district of Popayato, Province of Gorontalo during March to June 2011 showed also that CPB has seriously infested these plantations and some cacao farmers have even abandoned their plantation (Sembel and Team 2011, unpublished).

Reports presented by several participants at the Mid Term Workshop of SUCCESS Project held on January 15-18, in Makasar, South Sulawesi, Indonesia showed that within one year of the project there has been very substantial success in terms of reducing the intensity of attacks by CPB on participating farmers from about 85 % down to about 15-20% and potential increase in yield (Jaax, 2002; Simatupang, 2002; Farmers reports during the workshop, unpublished).

Redevelopment of cocoa industry in North Sulawesi is still very potential by rehabilitation of the existing cocoa plantations and extensification program through planting under coconut plantations. Cacao plantations have now being developed in the district of East Bolaang Mongondow in the southern part of N. Sulawesi. The total area of coconut plantations in North Sulawesi is estimated about 250.000 ha. Survey which was carried out in Central Sulawesi showed that cocoa plantations under coconut tree have lower intensity of attacks by CPB (La Daha and Jaax, 2002 unpublished).

Since early 1990s there has been no comprehensive study or survey on the distributions, intensity of attacks, intensity of damages, the role of natural enemies and methods of controlling CPB in North Sulawesi. Some works have been done by students such as on the distribution of CPB in Minahasa (Kangiden, 1997), the effects of variety on the attacks of CPB (Lebang, 1997) and a limited survey on the inventory of natural enemies of CPB at three cocoa plantations located only in Minahasa (Sulistyowati, 2002).

Indonesia is now the number three cocoa producer in the world and it is claimed that about 75 % of cocoa production in Indonesia comes from Sulawesi (Ala & Muhidong, 2002). National Movement for rehabilitation and redevelopment of cacao has already been started by the Government of Indonesia through the Directorate General of Perennial Crops (Dinas Perkebunan Sulawesi Utara dan Dinas Pertanian dan Perkebunan Kabupaten Pohnuato, Provinsi Gorontalo, 2010/2011. Laporan Lisan).

Berbagai cara pengendalian PBK telah dilakukan diantaranya dengan pemangkasan, frekuensi panen, sanitasi dan system rampasan, pengendalian hayati dengan menggunakan semut, *Dolichoderus thoracicus* dan jamur *Beauveria bassiana*, penyemprotan dengan insektisida serta dengan cara kondomisasi. Penggunaan cara kondomisasi telah dilakukan oleh Balai Penelitian Perkebunan Bogor pada tahun 1982 dan berhasil menurunkan tingkat kerusakan dari 80% menjadi 1%.

Kondomisasi dengan menggunakan kantong plasti dan kantong kertas coklat telah dicoba oleh petani kakao di Sulawesi Utara tetapi belum memberikan hasil yang baik dan hasilnya belum pernah dipublikasikan.

Objectives:

The objectives of this studies are: To study the use of different thickness of degradable plastic bags (polymer sleeves) and regular plastic bags in reducing the infestation of the cocoa moth borer. To study the difference on the methods above on an abandoned plantation and commercial plantation.

MATERIALS AND METHODS

Sleeving was carried out with 7 treatments, 0 %, 0.5 %, 1 %, 2%, and 3 % thickness of degradable plastic, regular plastic, and control (without sleeving) in a randomized block design. Between 200 to 300 of each treatment were sleeved at random on very young pods (< 8cm length) (Fig. 1), with open bottoms to allow ventilation (Fig. 2). The number of sleeved pods infected by cacao rot disease at the early stage of pod's development were recorded but excluded for the calculation on the percentage of infested pods by CPB because these pods were completely rotten before harvested.

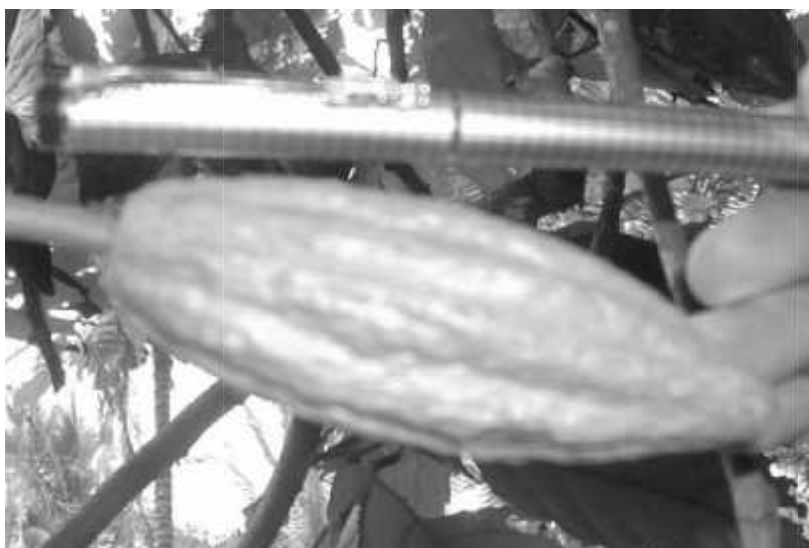


Fig. 1. Young cacao pod used for sleeving
(Gambar 1. Buah kakao muda yang digunakan untuk Penyarungan)



Fig. 2. Sleeved cacao pods at Pungkol plantation
(Gambar 2. Buah Kakao yang disarung di perkebunan Pungkol)

RESULTS AND DISCUSSION

Data on Fig. 3 & 4 below show that sleeving with plastic can reduce markedly the infestation by CPB. Between 85 to 95 % of the pods sleeved with degradable and non- degradable plastic at the commercial cacao plantation were not damaged by CPB but 96 % of control (unsleeved pods) were damaged by CPB. There was no significant difference between thickness of biodegradable plastic bags and with the ordinary plastic bag but there was a significant difference between fruits sleeved with plastic bags and those fruits without sleeving. This data showed that thickness of plastic bags has no effect on the infestation of the CPB. The most important thing seems to be that the fruits are protected physically from insect pests to deposit eggs on the surface of the fruits. Hence covering the entire fruit with

physical method will protect the fruits from the infestation of CPB.

Between 67 to 82 % of degradable plastic and 83 % of non-degradable plastic at an abandoned cacao plantation were protected from the attack by CPB but 88% of the control (unsleeved pods) were damaged by CPB. Visual observation obtained at a commercial plantation compared to an abandoned plantation revealed that there was no significant difference between treatments of different degradable plastic bags at two locations but better CPB control was obtained in the commercial plantation than in the abandoned one. Better CPB control at the commercial plantation at Pungkol is due to better maintenance of the plantation, better sanitation and better growth of plants.

Bogor Estate Crop Research Institute reported that sleeving with plastic bag can reduce the CPB infestation from 80% to 1 %.

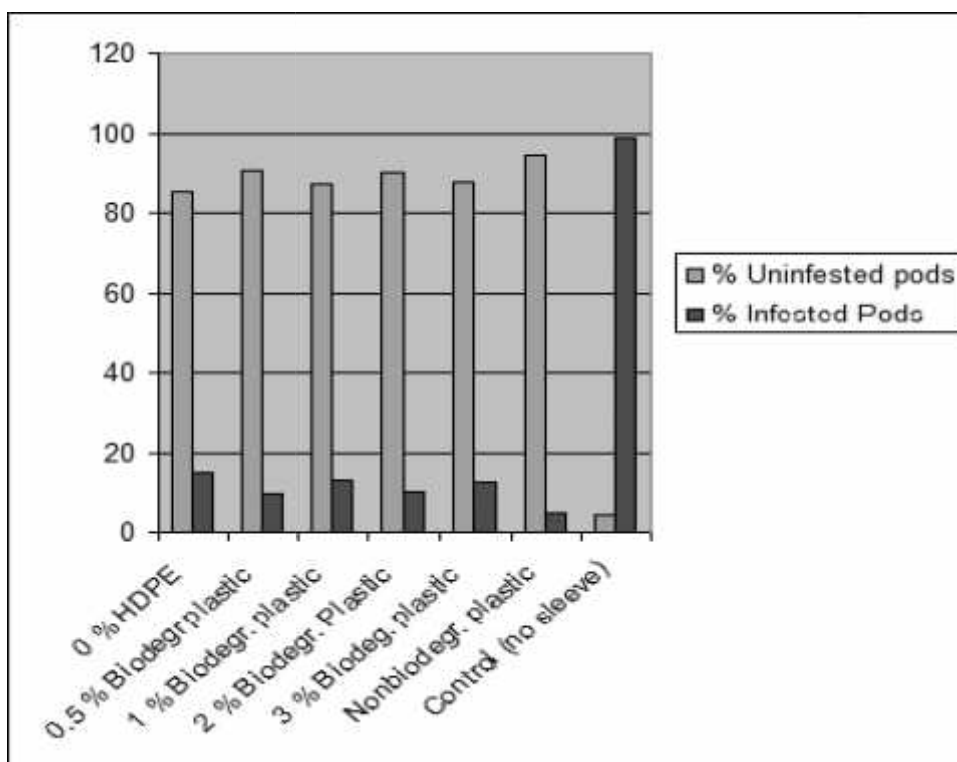


Fig. 3. Percentage of Infested and uninfested cacao pods by CPB at the commercial cacao plantation at Pungkol (Gambar 3. Persentase buah kakao yang terserang dan tidak diserang Oleh PBK di perkebunan Pungkol)

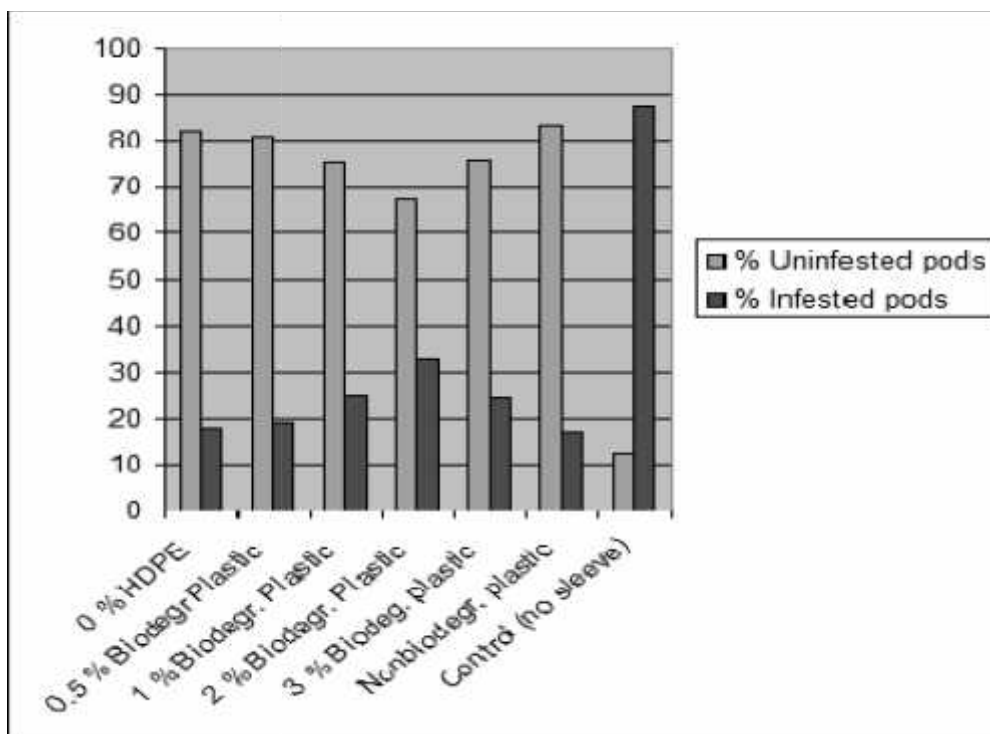


Fig. 4. Percentage of Infested and uninfested cacao pods by CPB at an abandoned cacao plantation at Sapa (Gambar 4. Persentase buah kakao yang terserang dan tidak terserang di Kebun kakao Sapa yang tidak terawat)

Some plastic used for sleeving were damaged by crickets (Fig. 5 A&B) and ants (Fig. 6 A&B) but damaged sleeves did not reduce the

protection from the attacked of CPB because these insects are known to be eggs predators of CPB.



A



B.

Fig. 5. A Cricket inside plastic bag (A) and a picture of cricket (B) (Gambar 5. Seekor kriket dalam kantong plastik (A) dan gambar kriket (B))



A



B.

Fig. 6. Ants inside and outside plastic bag (A) and plastic damaged by ants (B) (Gambar 6. Semut yang berada di luar kantong (A) dan kantong plastik yang rusak(B))

Although ants can act as predator of CPB, their presence on plantation can cause nuisance to the laborers who clean the plantation and also to the cocoa pickers.

CONCLUSION

Cacao pods sleeved with plastic (either degradable or non-degradable) can significantly reduced the damaged by CPB.

There was no significant difference between different concentration of degradable plastic versus regular plastic.

Better control with sleeving was obtained at the commercial than at an abandoned plantation

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