Caterpillar Bag As Pests At Sengon (Falcataria Moluccana (Miq.) Barneby And J.W Grimes) At Forest Area With Special Purpose (KHDTK) Haurbentes, Bogor-Indonesia

Yeni Nuraeni, Fransina S. Latumahina, Tekat Dwi Cahyono, Hani S. Nuroniah

Abstract: Caterpillar bag is an important pest that attack sengon plants. This type of pest has a variety of host plants, ranging from agricultural crops, plantations and forestry crops. This research was conducted at the Forest Area with Special Purpose (KHDTK) in Haurbentes, Bogor, West Java, Indonesia. Aims to identify, know the population and percentage of pest caterpillar attack. The research used purposive sampling method, taking 3 compound leaves on every 3 trees in one research plot. The number of observation plots is 15 plots. The results of identification in the laboratory, caterpillar pests that attack sengon plant are a type of Pteroma plagiophleps. The number of pest caterpillar populations varies on each observation plot with the highest population occurring in plot 14 with 114 caterpillars per 3 compound leaves and the lowest population occurs in plot 4 with 13 caterpillars per 3 compound leaves. The percentage of attack reached 100%, where all the plants in the observation plot were attacked by pest caterpillar, P. plagiophleps. After knowing its population and attack level, it is necessary to conduct a further research to control it using botanical pesticide and other friendly environmental methods.

Index Terms: Pteroma plagiophleps, percentage of attack, population, botanical pesticide.

1 INTRODUCTION

The wood processing industry in Indonesia is one of the barometers of national economic improvement and plays an important role in increasing the state revenue from the forestry sector. The rapid development of the timber industry encourages the increasing demand for wood raw materials by industry, requiring additional supply of raw materials from outside the forest area. The development of community forest is considered to meet these needs. In addition, community forest development can also provide economic benefits for forest communities [1]. The sengon plant is one of the most potential forest crops to be developed in the community forest because it is a fast growing pioneer plant. Sengon belongs to the family Leguminosae (Mimosoidae Sub-family). This species is well known by the name Adenanthera falcata Linn., Adenanthera falcataria Linn., Albizia falcata (L.) Backer, Albizia falcata sensu Backer, Albizia falcataria (L.) Fosberg, Albizia moluccana Miq. and better known as Paraserianthes falcataria [2]. Sengon wood has a density of about 0.4 g / cm^{-3} [3]. Compared with other species of same mass, the durability of this wood is higher so that sengon is widely used as building material [4]. Further development of Sengon wood is presented by Kabe, Darmawan [5] to show its quality as veneer materials. Meanwhile, Darmawan, Nandika [6] shows sengon adhering quality after it is made into a product of laminated veneer lumber.

- *Yeni Nuraeni, Forest Research and Development Center. Jl. Gunung batu No. 5. Bogor 16118. Indonesia. Telp. (0251) 8633234, 7520067 Fax. (0251) 8638111.*
- *Fransina S. Latumahina, Forestry Department, Faculty of Agriculture, Universitas Patimura. Ambon. Indonesia.*
- *Tekat Dwi Cahyono, University of Darussalam Ambon. Jl. Waehakila Puncak Wara. Ambon 97128. Indonesia. Corresponding author: tekatdwicahyono@gmail.com.*
- *Hani S. Nuroniah, Universitas Patimura. Ambon. Indonesia*

This product is still rarely produced in Indonesia and has the potential as one alternative building material in the future [7-9]. One of the problems faced in the cultivation of sengon plant is pest attack. This threat is coming from several organism types, either attacking plants as its nests or host plants as food materials [10-13]. Caterpillar bag is one type of pest that attack sengon plant, this pest attacking the leaves and bark. Repeated severe attacks can lead to the occurrence of die back on sengon. A 5-year-old sengon plant in South Sumatra has suffered severe attacks between 1994-1997 [14]. In Kerala India, Pteroma plagiophleps result in severe outbreaks in young sengon plants, killing 22% of 3-5 year old sengon plants and 17% other trees [15]. Sengon plant potential utilization in the future and serious threat to its cultivation process are one important reason to conduct this research. The purpose of this research is as follows: (1) To find out the type of caterpillar bag that attack sengon plant and biology, (2) To know the population of caterpillars in sengon in Forest Area With Special Purpose (KHDTK) Haurbentes, (3) To know the percentage of pest attack on sengon plant in KHDTK Haurbentes (4) To find out the damage caused by the caterpillar in sengon in KHDTK Haurbentes. The results of this research may provide various benefits for the development of forest plant pest sciences, distribution, attack level in particular areas. Strategic methods are further determined for its controling stages.

2 METHODS

2.1 Population Sampling

Population sampling was conducted on 15 sengon plant plots. From each plot there are 9 plants, from each plot taken 3 sengon plants. Sampling is done by counting the number of caterpillars on 3 pieces of leaves compound sengon plant. The population of pests per plot is calculated using the following formula (1):

Pest population = NPP/NPS (1)

Where:
NPP = Number of Pest Populations Per 3 Compound Leaf Sheets On The Observation Plot
NPS = Number of Plant Sample

2.2 Observation of percentage of pest attack

Observation of percentage of attacks is done visually. The formula used to calculate the percentage of attacks is as follows:

Attact Percentage = n/N x 100% (2)

Where:
n = The number of plants affected
N = Total number of plants

3 RESULT AND DISCUSSION

Based on the result of identification, The caterpillars that attack sengon plant in KHDTK Haurbentes is Pteroma plagiophleps. The population of caterpillar pests varies on each observation plot; the highest population occurs on plot 14, on average there are 114 pest caterpillar pests in every 3 pieces of sengon compound leaf. The lowest population occurred in plot 4 with an average of 13 caterpillars. Intensity of attack that happened is equal to 100%, this happened because all plant sengon in observation plot attack by caterpillar pest bag. The attack of the P. plagiophleps bag at KHDTK Haurbentes has reached the economic threshold so that if not done soon it will result in considerable loss of yield.

3.1. Identification and Biology of Caterpillar Bags

Pteroma plagiophleps Hamp. belonging to the family Psychidae, the order of Lepidoptera. The pouch made by P. plagiophleps is conical, made of shale leaves. This Caterpillar usually becomes an epidemic in a prolonged dry season. The egg phase lasts for 10 days, larvae 49 - 62 days and pupa 14 days. Total development period of male insects 2 months and female 2.5 months. Its dimorfis (two forms), male pupa has an exarata type (not shrouded in membrane), 2x4 mm in size is brown and the color of the abdomen is pale and the mesotoraks is clear. The female pupa shape resembles the caterpillar, measuring 2x10 mm, the abdomen is able to make a jump motion. Ovipositor (egg laying tool) is dark brown like a spoon[16]. The female insect is not winged, not legged and shaped like a caterpillar. Male moths are small with well developed wings. Wings range 1.3 - 1.4 cm, body color is light brown; Creamy white elliptical egg, measuring 0.8 x 0.75 mm. The caterpillar is creamy white with brown spots on the head and thorax. A full-blown, 1cm long caterpillar extends across the front and shrinks at the rear [16]. Caterpillar bag P. plagiophleps is an important defoliator in some plant species in India. This pest was first described by Hampson in 1892 from Sri Lanka. In the southern part of India, it is listed as a pest of Tamarindusindica (Caesalpiniaceae). In addition, this pest is also reported as a minor pest in the plant Punicagranata (Lythraceae) and Camelliathea (Theaceae). In 1981 there was reported severe defoliation in Albiziafalcataria (Mimosaceae) in plantation forest[17]. Symptoms of an attack on the sengon plant in KHDTK Haurbentes yellow leaves of sengon, hollowed by caterpillar bites and dries, whereas according toKalshoven [18] the worms eat from the bottom of the leaf, consume the lower side epidermal layer and mesopil tissue, and leave the upper side epidermal layer leaf (Figure 1). Then the caterpillar usually moves to the branches of the tree and often to the main tree trunk to eat the surface layer of the living skin leaving the wound on the stem (Figure 2). Towards being a pupa, the pouch changes shape into an elliptical shape and hangs using a silk thread on a limb. In a great attack, thousands of bags are seen hanging on a limb.

Figure 1. *Symptoms of pest caterpillar attack on sengon leaves*

Figure 2*. Caterpillar pests eat the surface layer of bark of sengon plant*

3.2. Identification and Biology of Caterpillar Bags

Pest populations of P. plagiophleps pest caterpillars in sengon plants in KHDTK differed in each plot where the highest population occurred on plot 14, that is, there were an average of 114 caterpillars per third leaf and the lowest population occurred in plot 4 with an average of 13 caterpillars per triple compound leaves. From Table 1 can be seen that the pest population is very high, if not immediately controlled then the pest population will pass the economic threshold (ET), according toSoejitno and Edi [19] Economic Threshold is the pest population limit used as the basis for the use of pesticides. Above ET pest populations have resulted in losses of greater value than controls. ET is a pest population density that requires control measures to prevent further population increases that can reach Economic Injury Level [20]. The Economic Injury Level (EIL) is defined as the lowest population solids resulting in economic damage. Economic damage occurs when the value of damage caused by pests equal to or greater than the cost of control is done, so there is no loss. Thus AE is the basis for pest control to use chemical pesticides [21].

***Table 1**. Population of pest caterpillar P. plagiophleps in sengon plants in KHDTK Haurbentes*

No. plot	No. sample trees	∑ Caterpillar bag On the Compound Leaf of			Total
		1st	2nd	3rd	
1	1	87	46	108	87
	8	81	60	74	81
	9	59	57	123	59
Number of caterpillars (tails)					227
Average caterpillar per 3 leaves (tails)					75
2	2	12	22	32	12
	5	18	18	7	18
	7	13	7	28	13
Number of caterpillars (tails)					43
Average caterpillar per 3 leaves (tails)					14
3	1	12	17	19	12
	6	160	32	38	160
	9	95	36	65	95
Number of caterpillars (tails)					267
Average caterpillar per 3 leaves (tails)					89
4	3	23	8	21	23
	6	9	10	9	9
	9	8	11	4	48
Number of caterpillars (tails)					40
Average caterpillar per 3 leaves (tails)					13
5	4	13	19	36	13
	8	99	56	25	99
	9	51	21	47	51
Number of caterpillars (tails)					163
Average caterpillar per 3 leaves (tails)					54
6	3	32	78	67	32
	6	29	26	30	29
	7	66	53	62	66
Number of caterpillars (tails)					127
Average caterpillar per 3 leaves (tails)					42
7	1	21	21	13	21
	4	20	49	56	20
	5	42	38	54	42
Number of caterpillars (tails)					83
Average caterpillar per 3 leaves (tails)					27
8	2	27	48	84	27
	4	57	34	60	57
	8	103	77	61	103
Number of caterpillars (tails)					187
Average caterpillar per 3 leaves (tails)					62
9	3	93	88	92	93
	4	68	39	86	68
	7	48	20	21	48
Number of caterpillars (tails)					209
Average caterpillar per 3 leaves (tails)					70
10	1	17	35	11	17
	5	43	82	72	43
	9	41	56	63	41
Jumlah ulat (ekor)					101
Rata-rata ulat per 3 helai daun (tails)					33
11	1	23	25	22	23
	5	16	17	11	16
	8	28	81	56	28
Number of caterpillars (tails)					67
Average caterpillar per 3 leaves (tails)					22
12	1	13	23	39	13
	3	30	16	27	30
	7	32	21	17	32
Number of caterpillars (tails)					75
Average caterpillar per 3 leaves (tails)					25
13	2	63	75	17	63
	4	144	124	67	144
	7	52	31	41	52
Number of caterpillars (tails)					259
Average caterpillar per 3 leaves (tails)					86
14	1	150	135	154	150
	5	55	157	122	55
	8	139	87	175	139
Number of caterpillars (tails)					344
Average caterpillar per 3 leaves (tails)					114
15	2	39	17	13	39
	4	23	14	13	23
	7	27	43	48	27
Number of caterpillars (tails)					89
Average caterpillar per 3 leaves (tails)					29

Table 2 shows a very high percentage of attacks, of the 15 plots observed entirely having been attacked by pest caterpillar P. plagiophleps so that the percentage of attack was 100% complete. If this is not immediately controlled then the losses caused by these caterpillar pests will be greater. The previous studies show that this pest type may result in losses as attacking not only sengon plant but also Theobroma cacao in moderate until high level [22]. This threat surely requires a proper control management.

***Table 2.** Percentage of caterpillar pest attack P. plagiophleps*

No. observation plot	Number of plants	Plants attacked	Percentage of attacks
1	7	7	100
2	6	6	100
3	8	8	100
4	7	7	100
5	8	8	100
6	6	6	100
7	6	6	100
8	6	6	100
9	7	7	100
10	8	8	100
11	5	5	100
12	5	5	100
13	5	5	100
14	7	7	100
15	5	5	100

Pest control of P. plagiophleps pest caterpillar can be done by using vegetable pesticide extract of gadung tuber (Dioscorea sp.) And nyamplung oil (Calophyllum inophyllum Linn.), which can give a real effect to mortality of P. plagiophleps [23]. Beside the botanical pesticides, its control management is also reported by Bakeri, Ali [24]. Paeciylomyces carneus and P. farinosus are proven to be able to delay the larva growth of Pteroma pendula. This type is considered as one bagworn pest found in oil palm. Kamarudin, Ahmad [25] control it with pheromone mass trapping. The other research, Kamarudin and Wahid [26] suggest to plan Cassia cobanensis around oil palm plantation to maintain the preservation of bagworm's natural enemies. The potential utilization of three botanical pesticide types, including Goryphus bunoh (Hymenoptera: Ichneumonidae), Eupelmus catoxanthae (Hymenoptera: Eupelmidae), and Eurytoma sp. (Hymenoptera: Eurytomidae) have ever been reported by Mahadi, Muhamad [27]. The next question is how the effectivity of the controlling methods implemented to bagworn pest attacking sengon plant. Further researches and the existing method modifications may answer these challenges.

4 CONCLUSION

The type of caterpillar encountered to attack sengon plant in

KHDTK Haurbentes is Pteroma plagiophleps. The average number of caterpillars in 3 pieces of compound leaves of sengon plant is 50.69, while the percentage of caterpillar attack reaches 100% because all sengon plants have been attacked by the caterpillar pests. Further research on proper controlling methods on bagworm at the Forest Area with Special Purpose (KHDTK) in haurbentes is greatly required. The results may provide a great impact in forest plant breeding and wood supply in the future.

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