Distribution of Invasive Plant Species and Recommendation for Management Actions at Bukit Duabelas, Jambi, Sumatera, Indonesia

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Abstract

Studies on the distribution of invasive plant species and their recommendation for management were conducted at Bukit Duabelas, Jambi, Sumatera, Indonesia. The aims of this study are (1) To gather a list of invasive plant species in Bukit Duabelas, Jambi, Sumatera, and their vicinity; (2) To determine their distribution in each ecosystem types (natural forest, jungle rubber, rubber and oil palm plantation); and (3) Risk analysis of the important invasive plant species. The data collection on the distribution and coverage of invasive plant species was conducted at the CRC 990 permanent plots (50 × 50 m^2). Spatial distribution pattern was conducted by creating vegetation profile diagram horizontally on the permanent plots. Scoring system of risk analysis was also conducting based on the protocol of risk management of invasive plant species. There are 76 species of invasive plant species belongs to 30 families at Bukit Duabelas and their vicinity. The number of invasive plant species varied on each location. High risk of invasive plant species infestations found at the disturbed areas and open areas. Residential area has the highest number of species, followed by oil palm plantation, rubber plantation, and jungle rubber. Invasive plant species were not found inside of the natural forest plots. It indicated that the natural forest is still in good condition from invasive plant species infestations. Mapping on the vegetation profile diagram was also prepared. Jungle rubber has the lowest number of invasive plant species compared with oil palm and rubber plantation. Scoring system of some important species was evaluated on their invasive plant risk factor and their feasibility. The result will be used for giving recommendation on the management of invasive plant species.

Inventory of Invasive Plants Species

The highest number of the species is Poaceae (15 sp.), followed by Asteraceae (11 sp.), and Euphorbiaceae (5 sp.). The rest of the family having one to four species, as shown in Figure 1a.

Origin of the Invasive Plant Species

Twenty three species (30%) of invasive plants were recognized as native plant species and 53 species (70%) as alien plant species. Most of the alien species native of America (32 species). Seven species came from Asia, 4 species came from Africa, the origin of 3 species were not known yet, and the rest of the species has a wide origin, as shown in Figure 1b.
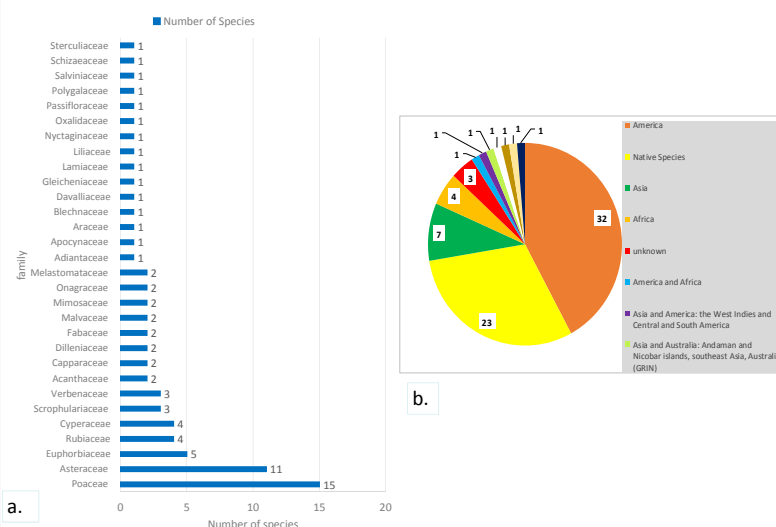

Figure 1. Species number of invasive plant species (a); Origin of invasive plant species (b)

Distribution of Invasive Plant Species

The ecosystem type with the largest species richness of invasive plant species was oil palm plantation (28 species), other ecosystems with relatively large number of invasive plants were rubber plantation (27 species), and jungle rubber (10 species). However invasive plant species were not found in the inside of natural forest plots, as shown in Table 1.

More than 30% of plot (50m x 50m) on the three ecosystems (jungle rubber, rubber plantation, and oil palm plantation) were invaded by invasive species. The highest invasive plant species infestation found in oil palm plantation with 73.85% invasive plants cover, followed by jungle rubber (45.39%), and rubber plantation (30.35%). The example of invasive plant species cover was prepared on the spatial form, Figure 2. There are 6 invasive plant species which found in all three ecosystems (jungle rubber, rubber plantation, and oil palm plantation) i.e. *Centotheca lappacea, Clidemia hirta, Dicranopteris linearis, Melastoma malabathricum, Scleria ciliaris,* and *Taenitis blechnoides.*

Table 1. The number of invasive plant species on each ecosystems type

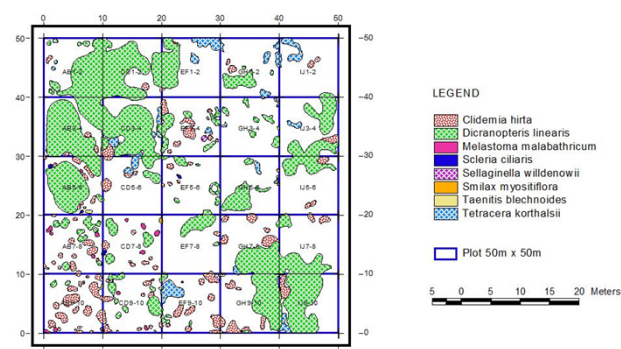| No.	Ecosystems type	No. of family	No. of genera	No. of species
1	Lowland forest	0	0	0
2	Jungle rubber	6	10	10
3	Rubber plantation	13	24	27
4	Oil palm plantation	13	27	28

Figure 2. Distribution of invasive species at BJ5 plot (jungle rubber)

Table 2. Scoring of invasive plant risk and feasibility of containment of invasive alien plant species *C. hirta* at BJ5 (jungle rubber plot)

No.	Species name	Invasive Plant Risk					Feasibility of containment				
		Invasiveness	Impacts	Potential Distribution	Score	Category	Control costs	Distribution	Persistence	Score	Category
1.	*Clidemia hirta*	2	1	2	4	low	2	2	2	8	medium

Risk assessment of *C. hirta* at the jungle rubber show that the invasive risk in category of low, and the feasibility of containment in a category of medium. This results indicated that limited action is suggested for controlling this species.

Conclusions

High risk of invasive species infestation found at the disturbed areas. Oil palm plantation (28 sp) and rubber plantation (27 sp) has the highest number of invasive plant species compare with jungle rubber (10 sp). Invasive plant species was not found in the natural forest plots. It indicated that the natural forest is still in good condition from invasive plant species infestation. There are two major invasive plant species: *Dicranopteris linearis* and *Clidemia hirta* wich were found at all three type of ecosystem, jungle rubber, rubber plantations as well as oil palm plantations. Risk assessment of *C. hirta* at the jungle rubber show that the invasive risk in category of low, and the feasibility of containment in a category of medium. This results indicated that limited action is suggested for controlling this species.

Bogor Agricultural University   University of Jambi   Tadulako University