Vol. 09, No. 01: 6 — 10
April 2020
DOI: 10.22487/25411969.2019.v9.i1.15037

Natural Science
Journal of Science and Technology

Original article

Weed Plant in Cacao and Clove Plantations in Lakatan Village, Tolitoli Regency, Central Sulawesi

Moh. Iqbal*, dan Hairil

Plant Biosystematics Laboratory, Biology Department, Faculty of Science, Tadulako University, Jln. Soekarno Hatta km 9 Tondo,Palu 94118, Sulawesi Tengah Indonesia

Keywords: Weeds, cocoa and cloves plantations, Lakatan Village, Central Sulawesi

Article history:
Received 16 March 2020
Accepted 27 April 2020
Published 29 April 2020

* Coresponding Author :
iqbalmoh89@gmail.com

Abstract

Diversity of weeds in Cacao plantations and Clove plantations at Lakatan Village, Tolitoli Regency, Central Sulawesi was conducted in May to August 2019. The method used is a double plot method with 16 plots and divided into two parts, 8 plots on cacao plantations and 8 plots on clove plantations randomly placed. Each type of weed contained in the plot was recorded and collected for the manufacture of herbarium specimens, identification was carried out at the Plant Biosystematics Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Tadulako University. The results showed 17 families with 29 species of weed in both plantation areas, 21 species in cacao plantations and 23 species in clove plantations. Families that are often found in both woods is Asteraceae with 6 species.

INTRODUCTION

Weed is a plant that easily to grow in different place, both in places that lack in nutrition to places that are rich in nutrients, this is the differnces between weeds and cultivated plants (Moenandir, 1993). Sauerborn, (1999) reported that more than 30,000 species of plants have been identified as weeds, 250 species have been identified as main weeds and 80 species have been known to reduce the crop yields. The growth of weeds are usually in accordance with the conditions of the plantation. Weeds in the highlands are generally have higher species diversity, compared to the lowlands (Rosmanah *et al.,* 2017).

Weeds are divided into several aspects, the first is based on the type of activity such as; the main weeds that can be controlled, harmful weeds in large numbers, toxic weeds, parasitic weeds, beneficial weeds but harmful in large quantities, and weeds that are not harmful. The second aspect is based on the life cycle such as; perennial weeds , biennial weed, and annual weeds. The last aspect is based on the morphology such as broadleaf weeds, narrowleaf weeds, pitched weeds and fern weeds (Tjitrosoedirjo *et al.*, 2011).

Plantation is an integral part of the agricultural sector in Indonesia, that have an important role compared to others, one of them is cocoa and clove plantations (Hendra, 2013). Cocoa Plantation is one of the main commodities in Indonesia that affect to the economics especially in providing employment, farmers income and foreign exchange for the country (Lukito *et al.,* 2006).

Lakatan Village, Galang, Toli-toli is one of the areas that most of the population uses the plantation for their daily necessities, with 332 hectares of plantations, consisting of clove and cocoa plantations. One of the current problems was the decreasing of the yields due to the weed attacks. Based on these descriptions, this study was aimed to obtained the species of weeds in Lakatan Village, Toli-toli and provided information about the diversity of weed in Central Sulawesi.

MATERIALS AND METHODS

This research was carried out in Lakatan Village, Tolitoli, Central Sulawesi, on the cacao and clove plantations, which was conducted in May 2019. The sampling was done by exploration method in both plantation areas. Weeds collection that found in the field were labeled with the collection number. Then the sample was pressed using sasak and moistened with spritus (Rugayah *et al.,* 2004). At the same time, documentation was collected for the weeds. The drying process was done by using an electric oven at 60°C-70°C until the sample was completely dry (Singh, 2010, Smith, 1971). Identification by comparing morphological character at Laboratory of Plant Biosystematic in Department of Biology FMIPA UNTAD. The reference book for identification by Weeds of Rice in Indonesia (Soerjani *et al.,* 1987), Pengelolaan gulma dalam sistem agroforestry kakao di Sulawesi Tengah (Tjitrosoedirjo *et al.*, 2011), 75 Important Invasive Plant Species in Indonesia (Tjitrosoedirdjo *et al*., 2016), Atlas of 220 weeds of sugarcane fields in Java (Backer& van Steenis, 1973).

RESULT AND DISCUSSION

The results (table 1) showed that there were 17 families obtained at the locations. The dominant family was the Asteraceae that consists of 6 species (figure 1).

Table1. Classification of the weeds in the cacao and clove plantation

No	Famili	Scientific Name	Ca	Cl
1	Asteraceae	*Ageratum conyzoides* (L.) L.	+	+
2		*Erigeron sumatrensis* Retz.	-	+
3		*Elephantopus mollis* Kunth	+	+
4		*Sphagneticola trilobata* (L.) Pruski	+	-
5		*Struchium sparganophorum* (L.) Kuntze	-	+
6		*Synedrella nodiflora* (L.) Gaertn	+	+
7	Aspleniaceae	*Pteridium* sp.	-	+
8	Campanulaceae	*Hippobroma longiflora* (L.) G. Don	+	-
9	Cleomaceae	*Cleome rutidosperma* Dc.	-	+
10	Cyperaceae	*Cyperus kyllingia* Endl.	+	+
11		*Scleria bancana* Miq.	+	-
12	Euphorbiaceae	*Euphorbia heterophylla* L.	+	+
13	Fabaceae	*Desmodium triflorum* (L.) DC.	+	-
14	Lamiaceae	*Hyptis capitata* Jacq.	+	+
15		*Lygodium circinatum* (Burm. F.). Sw	+	+
16	Lygodiaceae	*Lygodium japonicum* (Thunb.) Sw.	-	+
17	Nephrolepidaceae	*Nephrolepis biserrata* (Sw.) Schott	+	-
18	Oxalidaceae	*Oxalis barrelieri* L.	+	+
19	Phyllanthaceae	*Phyllanthus amarus* Schumach, & thonn	-	+
20		*Phyllanthus urinaria* L.	+	+
21	Piperaceae	*Peperomia pellucida* (L.) Kunth	-	+
22	Poaceae	*Axonopus compressus* (Sw.) P. Beauv	+	+
23		*Centotheca lappacea* (L.) Desv	+	+
24		*Imperata cylindrica* (L.) Raeusch.	+	-
25		*Paspalum conjugatum* P. J. Bergius	+	+
26	Polygalaceae	*Polygala paniculata* L.	+	+
27	Pteridaceae	*Pityrogramma calomelanos* (L.) Link	+	+
28	Rubiaceae	*Spermacoce laevis* (Lam.) Griseb	+	+
29		*Spermacoce* sp	-	+

Notes: Ca = Cacao, Cl = Clove

Figure 1. A. *Agerataum conyzoides* (L.)L. B. *Elephantopus millis* Kunth. C. *Oxalis barrelieri* (L.). D. *Hippobroma longiflora* (L.) G. Don, E. *Spermacoce* sp. F. *Phyllanthus urinaria* L.. G. *Euphorbia heterophylla* L. H. *Synedralla nodiflora* (L.) Gaertn. I. *Sphagneticola tribolata* (L.) Pruski. J. *Erigeron sumatrensis* Retz. K. *Centotheca lappacea* (L.) Desv. L. *Axonopus compressus* (Sw.) P. Beauv. M. *Scleria bancana* Miq. N. *Cyperus killingia* Endl. O. *Paspalum conjugatum* P.J. Bergius. P. *Imperata cylindrica* (L.) Raeusch. Q. *Pityrogromma caleomolanos* (L.) Link. R. *Nephrolopis biserrata* (Sw.) Schott. S. *Ptridium* sp. T . *Lygodium japonicum* (Thunb.) Sw.

The result showed that there were 15 species of weeds in the cacao and clove Plantation (Table 1), but there were 14 species found in cocoa plantations but not found in clove plantations. This was caused by several factors such as controlling in the cocoa plantations were more often than the clove plantations. Controlling the growth of the weeds was aimed to to suppress the weed populations that are economically disadvantageous (Abadi *et al.,* 2013). The cacao and clove plantation are the open plantation areas so that the weeds still grow easily, the closure of the canopy was the lowest and the distance of planting trees from one to another were 8-9m, so that the weed plants can grow well. Plants need the sun to grow well, but only the weeds can be grown because the canopy of the cacao and clove plantations were very tight. Nggunu *et al.,* (2019) clove can grow and develop well at a temperature of 22-30°C and high rainfall, which ranges from 2,000-4,500 mm/year with dry season short periods.

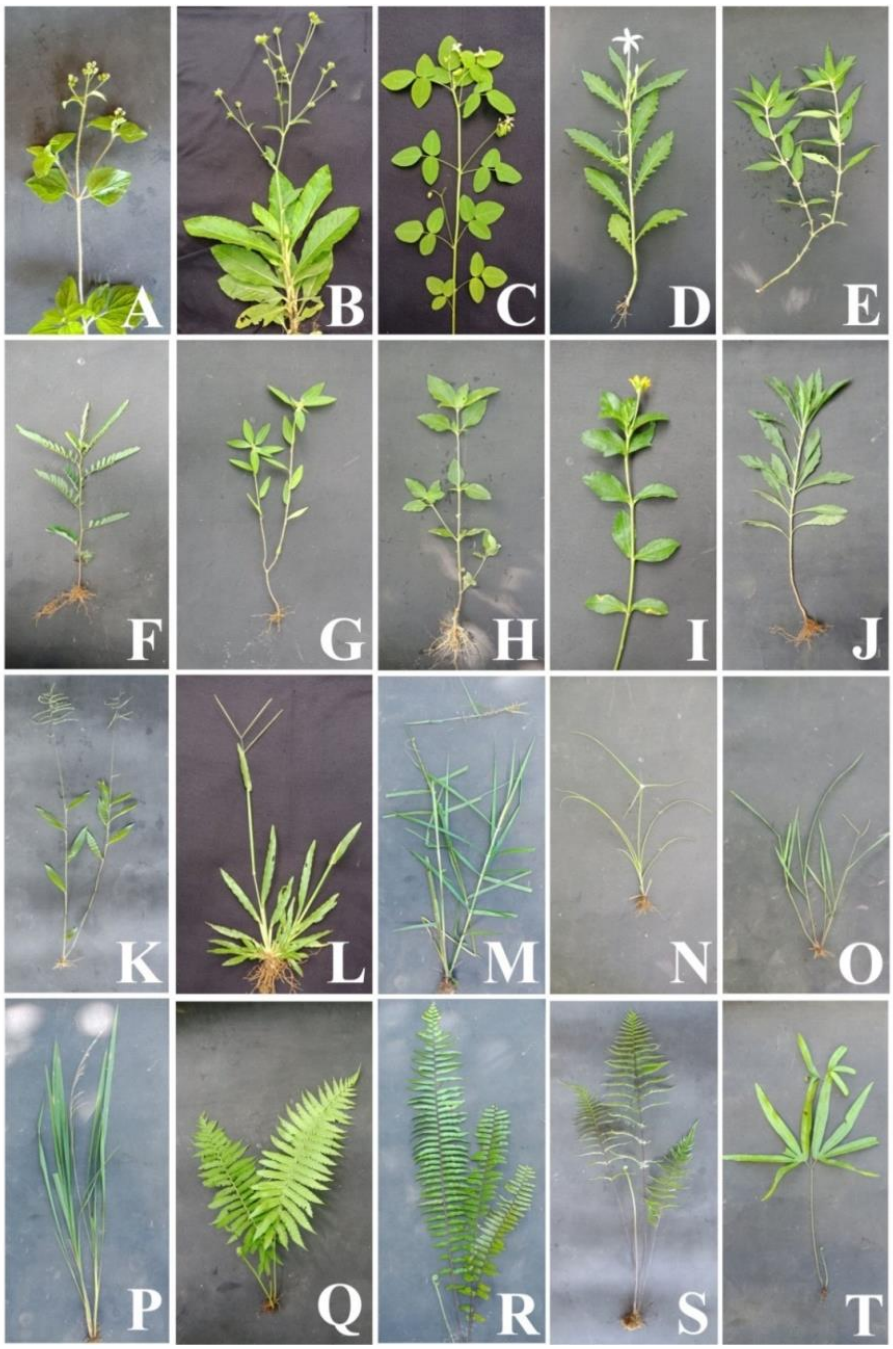

Figure 1. A. *Ageratum conyzoides* (L.)L. B. *Elephantopus millis* Kunth. C. *Oxalis barrelieri* (L.). D. *Hippobroma longiflora* (L.) G. Don, E. *Spermacoce* sp. F. *Phyllanthus urinaria* L.. G. *Euphorbia heterophylla* L. H. *Synedralla nodiflora* (L.) Gaertn. I. *Sphagneticola tribolata* (L.) Pruski. J. *Erigeron sumatrensis* Retz. K. *Centotheca lappacea* (L.) Desv. L. *Axonopus compressus* (Sw.) P. Beauv. M. *Scleria bancana* Miq. N. *Cyperus killingia* Endl. O. *Paspalum conjugatum* P.J. Bergius. P. *Imperata cylindrica* (L.) Raeusch. Q. *Pityrogromma caleomolanos* (L.) Link. R. *Nephrolopis biserrata* (Sw.) Schott. S. *Ptridium* sp. T . *Lygodium japonicum* (Thunb.) Sw.

The dominant family was the Asteraceae that consists of 6 species (figure 1). This is in accordance with Hamid, (2010), explained that the family that dominated in Nalbessy Village was the Asteraceae, because the Asteraceae can multiply through the seeds and adapt to the environment with a less water to the wet place, requires sunlight and resistant to the shade, so that it can multiply quickly (Reader and Buck, 2000). Tjitrosoedirdjo *et al.,* (2016) explained that with many seed can produce many new individuals. In addition, the dispersal of Asteraceae seeds is effective due to the presence of pappus structures derived from modified leaf petals (Pysek, 1997). Sphagneticola species can also propagate vegetatively so they are easy to grow (Thaman, 1999). Sari and Rahayu., (2013) reported that the dominant family was Poaceae, in accordance with Adriadi *et al.,* (2012). This is in accordance with Hamid, (2010), explained that the family that dominated in Nalbessy Village was the Asteraceae, because the Asteraceae can multiply through the seeds and adapt to the environment with a less water to the wet place, requires sunlight and resistant to the shade, so that it can multiply quickly (Reader and Buck, 2000). Sari and Rahayu, (2013) reported that the dominant family was Poaceae, in accordance with Adriadi *et al.,* (2012). Meanwhile, in the sugar cane plantations in Situbondo that are often found are Fabaceae and Asteraceae (Hariri and Irsyam, 2019). Meanwhile, the dominating weeds of oil palm peatlands are Fimbristylis acuminata, Nephrolepis biserrata, Cyperus compressus, Murdannia nudiflora, Digitaria ciliaris, and Davallia denticulata (Syahputra *et al.,* 2011).

Weed plants can be grouped into broadleaf weeds, narrowleaf weeds and fern weeds (Tjitrosoedirjo *et al.,* 2011). Group of weeds based on the shape of weed plant leaves. broadleaf weeds have a pinnate and palmate leaf. Narrowleaf weed have linear leaf and parallel vein. Fern weed is Pteridophyta group has sorus. The result showed that there were 17 species of the weeds that are classified into broadleaf weeds consisting of 11 families. The narrowleaf weeds consist of 6 species and 2 families and the fern weeds consist of 6 species and 4 families (figure 1).

According to Holm *et al.,* (1977), reported that Axonopus compressus (Sw.) P. Beauv, Centotheca lappacea (L.) Desv, Desmodium triflorum (L.) DC., Imperata cylindrica (L.) Raeusch, Lygodium japonicum (Thunb) Sw., Nephrolepis biserrata (Sw.) Schott, Paspalum conjugatum PJ Bergius, Pityrogromma calomelanos (L.) Link, Pteridium sp, Scleria bancana Miq., Spermacoce sp, Sphagneticola trilobata (L.) Pruski were dangerous and can be harmful to the Plantation. Lowe *et al,* (2000) decided I. cylindrical (L) in the list of 100 species the world's worst invasive alien species. Abywijaya *et al,* (2014) reported I. cylindrical (L) second dominant of weed in Nature Reserve Sempu Island. Weeds in the planting area will disturb and reduce the production of a plantation. In general weeds can reduce the growth of plantation crops through competition for water and nutrients (Tanasale, 2010). Weeds can spread to plantations with generative through seeds and spores, however, some species of weeds can go through vegetatives such as stolons and rhizomes (Hamid, 2010). in addition, Soerjani, *et al.,* (1987); Suryatini, (2018) describes an effective weed dispersing agent through water (hydrocores), animals (zookori), mamalia (mamakori) and wind (anemokori).

The principle of controlling the growth of weeds was by suppressing the population of weeds that are not affect to the farmers economically. Restoring all the weeds completely were in the different and limited places. Some of the methods were used to reduce the weeds including preventively control, mechanical control and technical control (Rukmana and Saputra, 1999). Generally in the Lakatan village, the preventing control were done traditionally such as using simple tools (hoes, sickles, machetes and lawn mowers) and the chemical control was done by herbicides, in accordance with Hamid, (2010) in Nelbessy Village farmers cloves controlling of weed by mechanical and traditional, with damaging parts of the weeds so that weeds die or stunted growth..

AKNOWLEDGEMENT

We would like to thank to Mr. Sadli S.Sos as the head of Lakatan Village for the approval in the cocoa and clove plantations, to Evans Madiono S.Si who helped in sampling. To Sahlan S.Si who helped to identified the plants at the Plant Biosystematics Laboratory, Department of Biology Faculty of Science, Tadulako University.

REFERENCES

Abadi, IJ., Sebayang, HT. and Widaryanto, E. 2013. Pengaruh jarak tanam dan teknik pengendalian gulma pada pertumbuhan dan hasil tanaman ubi jalar (*Ipomoea batatas* L.). *Jurnal Produksi Tanaman*. 1(2): 8–16.

Abywijaya, IK., Hikmat, A. and Widyatmoko, D. 2014. Keanekaragaman dan pola sebaran spesies tumbuhan asing invasif di Cagar Alam Pulau Sempu, Jawa Timur. *Jurnal Biologi Indonesia*. 10(2): 221–235 DOI: https://doi.org/10.14203/jbi.v10i2.2103

Adriadi, A., Chairul and Solfiyen. 2012. Analisis Vegetasi Gulma pada Perkebunan Kelapa Sawit (Elais quineensis jacq.) di Kilangan,

Muaro Bulian, Batang Hari. *Jurnal Biologi UNAND*, *1*(2):108–115. DOI: https://doi.org/10.25077/jbioua.1.2.%25p.2012

Backer, CA., and van Steenis, CGGJ. 1973. Atlas of 220 weeds of sugar-cane fields in Java. Ysel Press. Deventer.

Hamid, I., 2010. Identifikasi gulma pada areal pertanaman cengkeh Eugenia aromatica) di Desa Nalbessy Kecamatan Leksula Kabupaten Buru Selatan. *Agrikan: Jurnal Agribisnis Perikanan*. 3(1): 62–71. DOI:https://doi.org/10.29239/j.agrikan.3.1.62-71

Hariri, MR. and Irsyam, ASD., 2019. Jenis-jenis Gulma Pada Kebun Tebu di Kecamatan Asembagus, Situbondo, Jawa Timur: Kelompok Eudikotiledon. *Jurnal Riset Biologi dan Aplikasinya.* 1(2): 47–53.

Hendra, JH., 2013. Strategi pengembangan agribisnis komoditas cengkeh dalam meningkatkan pendapatan petani di Kabupaten Trenggalek. *Jurnal Manajemen Agribisnis*. 13(2): 45–56.

Holm, LG., Plucknett, DL., Pancho, JV. and Herberger, JP. 1977. *The world's worst weeds. Distribution and biology*. University press of Hawaii, Honolulu. Hawaii (USA).

Lowe, S., Browne, M., Boudjelas, S. and De Poorter, M., 2000. *100 of the world's worst invasive alien species: a selection from the global invasive species database*. Hollands Printing Ltd, New Zealand.

Lukito, A. M., Mulyono., Tetty, Y., dan Iswanto, H (eds). 2006. *Panduan lengkap budidaya kakao*. PT. Agro Media Pustaka. Jakarta.

Moenandir, J., 1993. *Pengantar ilmu dan pengendalian gulma*. Rajawali Pers, Jakarta.

Nggunu, W., Sakdiyah, S.H. and Suprianto, A., 2019, December. Kajian Faktor-Faktor Yang Mempengaruhi Produktivitas Cengkeh Di Desa Purwodadi Kecamatan Tirtoyudo Kabupaten Malang. *Proceeding on Seminar Nasional Fakultas Ilmu Pendidikan*, Vol. 3: 672–678).

Pysek, P. 1997. Compositae as invaders: better than others?. *Preslia*. 69(1): 9-22.

Reader and Buck, 2000. *Weed Growth in Environmental Conditions*. PT. Gramedia Press. Jakarta.

Rosmanah, S., Kusnadi, H. and Harta, L., 2017. Identifikasi dan Dominansi Gulma Pada Lahan Kering Dataran Tinggi di Kabupaten Kepahiang Provinsi Bengkulu. Proceeding on Seminar Nasional Agroinovasi Spesifik Lokasi Untuk Ketahanan Pangan Pada Era Masyarakat Ekonomi ASEAN. Bandar Lampung, 19–20 Oktober 2016.

Rugayah, Retnowati, A., Windadri, F I., dan Hidayat, A. 2004. Pengumpulan data taksonomi, In Rugayah Widjaja E A, Pratiwi, Pedoman Pengumpulan Data Keanekaragaman Flora Bogor. Puslit LIPI. Bogor.

Rukmana, HR. and Saputra, US. 1999. *Gulma dan Teknik Pengendalian*. Kanisius. Jakarta. Indonesia.

Sari, HFM. and Rahayu, S.B., 2013. Jenis-Jenis Gulma yang Ditemukan di Perkebunan Karet (Hevea brasiliensis Roxb.) Desa Rimbo Datar Kabupaten 50 Kota Sumatera Barat. *Biogenesis: Jurnal Ilmiah Biologi*, 1(1): 28–32. DOI: https://doi.org/10.24252/bio.v1i1.444

Sauerborn, J. 1999. Legumes used for weed control in agroecosystems in the tropic, *Plant Research and Development.* 50: 74–82

Singh, G., 2010. *Plant systematics: an integrated approach*. Science publisher. New Hampshire. Jersey, USA.

Smith, C.E., 1971. *Preparing herbarium specimens of vascular plants* (No. 348). Agricultural Research Service, Agriculture Information Bulletin 348, Agricultural Research Service, USDA, Washington.

Soerjani, M., Kostermans, AJG. and Tjitrosoepomo, G. 1987. Weeds of rice in Indonesia. Balai Pustaka.. Jakarta.

Suryatini, L. 2018. Analisis keragaman dan komposisi gulma Pada tanaman padi sawah. *Jurnal Sains dan Teknologi*. 7(1):77–89. DOI: https://doi.org/10.23887/jst-undiksha.v7i1.10395

Syahputra, E., Sarbino., Dian, S. 2011. Weeds assessment di perkebunan kelapa sawit lahan ambut. *Jurnal Perkebunan & Lahan Tropika*, 1: 37–42. DOI: http://dx.doi.org/10.26418/plt.v1i1.120

Tanasale, V., 2010. Komunitas Gulma Pada Pertanaman Gandaria Belum Menghasilkan dan Menghasilkan Pada Ketinggian Tempat yang Berbeda. [Thesis]. *Universitas Gadjah Mada. Yogyakarta.*

Thaman, RR. 1999. Wedelia trilobata: Daisy invader of the Pacific Islands. IAS technical report, 99/2. University of the South Pacific Suva, Fiji Islands. pp.1–10

Tjitrosoedirdjo, S., Tjitrosoedirdjo, S.S. and Setyawati, T., 2016. *Tumbuhan Invasif dan Pendekatan Pengelolaannya*. SEAMEO BIOTROP. Bogor. pp 1–282.

Tjitrosoedirdjo, S.S., Tjitrosoedirdjo, S., Mochtar, M. and Cicuzza, D., 2011. Pengelolaan Gulma dalam Sistem Agroforestri Kakao di Sulawesi Tengah. IPB Press. Bogor.