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Weeds Associated with Papaya Plants (*Carica Papaya* L.) in Bengkulu

Nia Kurniati Marpaung [1], Mimi Sutrawati [1*], Ridha Rizki Novanda [2], Dwi Wahyuni Ganefianti[3], and Tunjung Pamekas[1]

[1]Departement of Plant Protection, Faculty of Agriculture, University of Bengkulu

[2]Departement of Social Economics of Agricuture, Faculty of Agriculture, University of Bengkulu, Indonesia

[3]Departement of Agrecotecnology, Faculty of Agriculture, University of Bengkulu

Corresponding Author: mimi_sutrawati@unib.ac.id

ABSTRACT: Papaya crops associated with weeds are commonly found in Kepahiang and Rejang Lebong district, Bengkulu. The presence of weeds can affect the development and productivity of papaya. Until now, the species and diversity of weeds associated with papaya crops have not been reported. This study aimed to identify and determine weed density around papaya crops. Sampling was conducted to measure and calculate weed density using the quadratic method measuring 1 m x 1 m. The data collection was done by randomly taking the weeds on the plots as many as 10 points. Based on the result of weed identification, there were 16 species of weeds spread over 9 families. The calculation of the highest relative density in Padang Lekat, Durian Depun Village and Dua Jalur Road was Ageratum conyzoides (0,584%), Claytonia perfoliata (0,306%) and Eleusine indica (0,274%).

Keywords: Diversity, identification, papaya, weed.

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INTRODUCTION

Papaya (*Carica papaya* L.) is an economically important fruit crop due to its high nutritional content (Schweiggert et al., 2014). Papaya fruit has a relatively high selling power because of its many benefits (Aravind et al., 2013). The Central Statistics Agency (2019) reported that papaya production in Bengkulu province in 2019 was not as high as in 2015. The decline in papaya production could be caused by disturbances of plant-disturbing organisms, namely pests, diseases, and weeds. Yield losses due to papaya yellow mosaic disease in Bengkulu were reported to reach Rp. 9,135. 203 per year (Novanda et.al. 2021). There have been no reports of weed species associated with papaya plants in Bengkulu and their potential as alternative hosts for papaya pathogenic viruses.

Weeds associated with papaya plants can cause direct losses through space competition and nutrient competition, inhibiting the growth and development of papaya plants (Korav et al., 2018). This is becoming increasingly important because weeds can release toxic compounds (allelopathic) excreted by weeds (Umiyati and Kurniadie, 2016).

Weeds can cause indirect losses as host plants for pests and pathogens that cause field diseases (Subagyo and Hidayat, 2014). Identification of weed types and calculation of weed density can be the first step in developing weed control strategies in the future. This study aims to identify the types of weeds and calculate the density of weeds associated with papaya plants.

MATERIALS AND METHODS

This research was carried out from February to May 2021 in 3 locations, including Padang Lekat Village and Durian Depun Village, Kepahiang Regency and Dua Jalur Road, Rejang Lebong Regency.

Sample Collection

Weed sampling took weeds directly on the sample plots with the square method measuring 1 x 1 m. Weed sampling points were carried out 10 times which were taken randomly. The sample plots are arranged diagonally, delimiting each plot using a raffia string. The weeds were identified and counted according to the plots and plot numbers. After identification, the relative density is calculated.

Weed Species Identification

Identification of weed species is carried out by taking weed samples from the field and identifying them in the laboratory based on the weed identification book collection of the Agrotechnology Laboratory: Weeds of Rice in Indonesia: Weed Leaf Broad (Soerjani et al., 1987)

Weed Density

The formula used to calculate weed density according to Sembodo (2010):

$$\text{Density (D)} : \frac{\text{Number of weeds}}{\text{area}}$$

Relative Density (KR) :

$$\frac{\text{The density of one type of weed}}{\text{The total density of all types of weed}} \times 100\%$$

Data Analysis

The data from the identification of weeds and the calculation of weed density were analyzed descriptively.

RESULTS AND DISCUSSION

Weed Identification from Papaya Plantation

Based on the observations, 16 species from 8 families (Commelinaceae, Euphorbiaceae, Poaceae, Portulacaceae, Asteraceae, Capparidaceae, Cyperaceae and Acanthaceae) were obtained. In general, the types of weeds identified were broadleaf (12 species), grass (2 species), teki (2 species) (table 1).

Table 1. The results of the identification of weeds in papaya (*Carica Papaya* L.) plantations in Kepahiang and Rejang Lebong districts

Species	Family	Clasification
Euphorbia hirta	Euphorbiaceae	broadleaf
Phyllanthus niruri	Euphorbiaceae	broadleaf
Commelina diffusa	Commelinaceae	broadleaf
Eleusine indica	Poaceae	
Setaria viridis	Poaceae	Grass
Claytonia perfoliata	Portulacaceae	broadleaf
Cleome rutidosperma	Capparidaceae	broadleaf
Ageratum conyzoides	Asteraceae	broadleaf
Galinsoga parviflora	Asteraceae	broadleaf
Crassocephalum crepidioides	Asteraceae	broadleaf
Conyza sumatrensis	Asteraceae	broadleaf
Synedrella nodiflora	Asteraceae	broadleaf
Micania micrantha	Asteraceae	broadleaf
Asystasia gangetica	Acanthaceae	broadleaf
Cyperus rotundus	Cyperaceae	Teki
Cyperus kyllingia	Cyperaceae	Teki

Broadleaf weeds from the Asteraceae family dominated the field with a total of 6 weed species, including Ageratum conyzoides, Galinsoga parviflora, and Crassocephalum crepidioides, Conyza sumatrensis, Synedrella nodiflora, Micania micrantha. The Asteraceae family is one of the largest families of flowering plants with many genera and species. Members of the family Asteraceae have so far been studied in relation to the effects of climate change on evolution and character in plants. (Tadesse, 2015).

The Asteraceae family also dominates plant vegetation on earth with more than 24,000 – 30,000 species and 1600 – 1700 genera spread and inhabiting almost all environments except Antarctica (Funk et al., 2005). The Asteraceae family has properties that are easy to grow, produce many seeds and have excellent dispersal power in various wet and dry lands (Utami et al., 2020).

Synedrella nodiflora is an herbaceous plant with a height of up to 22 cm. It has round, erect, and green stem, with a hairy oval-shaped leaf, pinnate leaf bones, pointed leaf shoots, blunt leaf base and jagged. The inflorescence consists of a marginal flower and a disc flower colored yellow located in the terminal (at the end of the branch) (Oktarina and Salamah, 2017). S. nodiflora can grow well in various environmental conditions (Souza Filho and Takaki, 2011). In addition, pollen can also be carried accidentally in plant seeds after harvesting on cultivated land (Susanto et al., 2018).

Mikania micrantha is an herbaceous plant with spreading, round, green stems. The leaves are broad cordate or the base is short contracted, and the shoots are acutely tapered, pinnate with three nerves and opposite. This plant can be found in a place exposed to full sun (Oktarina and Salamah, 2017). Where:m conyzoides is an herbaceous plant with a height of up to 40 cm. The stems are erect, round, and green. The leaves are ovate, pinnate, serrated, blunt at the top and rounded at the base. The iP. orescence is a corymbus compound, has many purplish-white flowers and is in the terminal (Oktarina and Salamah, 2017). A. conyzoides has high competitiveness, so it quickly grows everywhere and often becomes a weed detrimental to farmers (Okunade, 2002). A. conyzoides can spread rapidly through stolons (Kohli et al., 2006) and form dense monospecific stands of up to 1000 plants per m^2 (Ekeleme et al., 2005).

Galinsoga parviflora is a 15 cm tall herbaceous plant. The stems are erect, round, and green. The leaves are oval, three midribs with pinnate leaf bones, serrated, green, blunt at the tip, and pointed at the base. The inflorescence consists of white and yellow marginal diskette flowers (Oktarina and Salamah, 2017). G. parviflora is mainly found in the highlands (Jang et al., 2014) and can grow abundantly on soils with fertile and well-drained organic matter, with soils with a pH of 4.8 to 6.0 (Santosa et al., 2020). Conyza sumatrensis is an annual herbaceous plant with a height of up to 200 cm—stem erect, covered with feathers with many branches from the base. The leaves are simple, alternate, and very serrated (Opiyo et al., 2010).

Weeds Density

Table 2. Weed density in Padang Lekat Village, Kepahiang District

Species	Population	Density (%)
Commelina diffusa	35	0,020
Euphorbia hirta	80	0,047
Cyperus kyllingia	147	0,086
Claytonia perfoliata	32	0,019
Micania micrantha	17	0,010
Ageratum conyzoides	998	0,584
Asystasia gangetica	77	0,045
Cleome rutidosperma	123	0,072
Conyza sumatrensis	95	0,056
Crassocephalum crepidioides	104	0,061

The calculation of weed density in Padang Lekat, Kepahiang Regency showed that 3 types of weeds dominated in each plot: Ageratum conyzoides, Cyperus kyllingia, and Cleome rutidosperma. The least species found in each plot was Micania micrantha at 0.010%. At the highest relative density, Ageratum conyzoides of 0.584%, it shows that many Ageratum Conyzoides populations are found in all sample plots and Ageratum Conyzoides populations cover more of the soil surface area than other weed types.

Table 3. Weed density in Durian Depun Village, Kepahiang District

Species	Population	Density (%)
Commelina diffusa	173	0,108
Euphorbia hirta	156	0,098
Eleusine indica	219	0,137
Claytonia perfoliata	489	0,306
Phyllanthus niruri	86	0,054
Ageratum conyzoides	204	0,128
Cleome rutidosperma	84	0,053
Galinsoga parviflora	156	0,098
Setaria viridis	33	0,021

The results of the calculation of weed density in Durian Depun Village, Kepahiang District showed that 3 types of weeds were dominating in each plot, namely, Claytonia perfoliata, Eleusine indica, and Ageratum conyzoides. The least species found in each plot was Setaria viridis at 0.021%. The highest relative density, namely Claytonia perfoliata, was 0.306%, indicating that a large population of Claytonia perfoliata was found in all sample plots and the Claytonia perfoliata population covered more of the soil surface area than other types of weeds. The lowest was in *Setaria viridis*.

Table 4. Weed density on Dua Jalur Road, Rejang Lebong Regency

Species	Population	Density (%)
Cyperus rotundus	187	0,090
Euphorbia hirta	68	0,033
Eleusine indica	568	0,274
Claytonia perfoliata	513	0,248
Ageratum conyzoides	174	0,084
Synedrella nodiflora	47	0,023
Phyllanthus niruri	16	0,008
Conyza sumatrensis	193	0,093
Setaria viridis	67	0,032
Crassocephalum crepidioides	238	0,115

The results of the calculation of weed density on Dua Jalur Road, Rejang Lebong showed that 3 types of weeds dominated in each plot, namely, Eleusine indica, Claytonia perfoliata, and Crassocephalum crepidioides. The least species found in each plot was Phyllanthus niruri at 0.008%. The highest relative density, namely Eleusine indica of 0.274%, indicated that many Eleusine indica populations were found in all sample plots and Eleusine indica populations covered more land surface area than other weed types.

The number of species that make up a community indicates that the community has high species diversity. The types of weeds that exist in a field have the potential to dominate the land through the propagation of seeds stored in the soil. Most types of grass and herbaceous vegetation have denser seeds than woody species, and soil conditions can determine the distribution of weed seed deposits in the soil (Shiferaw et al., 2018).

Differences in weed density will determine the magnitude of weed disturbance (Christia et al., 2016). High weed density affects crop yields (Hasanuddin et al., 2012) and provides food, shelter, and a breeding ground for insects, nematodes, pathogens, and other pests.

CONCLUSION

A total of 16 weed species from 9 families were identified with the highest relative density calculations in Padang Lekat Village, Durian Depun Village and Dua Jalur Road, respectively, Ageratum conyzoides at 0.584%, Claytonia perfoliata at 0.306% and Eleusine indica at 0.274%.

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