Original Research Article

Identification of Refugia Plants in Vegetable Crops in Agam, West Sumatera

ABSTRACT

Aims: The study aimed to identify the refugia plants in vegetable crops in Agam regency, West Sumatera, Indonesia.
Study design: Purposive random sampling
Place and Duration of Study: The research was conducted in vegetable plantations in Agam regency, West Sumatera and Laboratory of Weeds, Faculty of Agriculture, Andalas University, Padang, Indonesia from May to October 2023.
Methodology: Purposive random sampling was use as method in the study. Three districts were chosen as sampling locations (AmpekAngkek, Banuhampu and Sungai Pua). In each district, two nagari (Sub-district) were chosen to determine vegetable plantations. In each nagari, two widest area of crop Plantation were chosen as locations. The refugia plants were collected and brought to Laboratory to identify. The identification was conducted in Laboratory of Weed, Faculty of Agriculture, Andalas University.
Results: 12 refugia plants were found in vegetable crops in Agam regency, *Tagetes* spp., *Cosmos* spp., *Catharanthus roseus*, *Melastomamalabathricum*, *Brassica oleracea*, *Melampodium* spp., *Helianthus annuus*, *Coleus scutellarioides*, *Momordica charantia*, *Tagetes* spp., *Ipomoea* spp. dan *Tagetes erecta*.
Conclusion: There is various refugia plants in vegetable crops in Agam regency

Keywords: Agam, refugia, vegetable

1. INTRODUCTION

Vegetable is common name of food material from high water content plant and consumed in fresh condition or after minimal processing. It is important commodity in supporting national food security. This commodity has a wide variety and acts as source of carbohydrates, plant-bases protein, vitamins and minerals [1].

West Sumatera is one of vegetable producer in Sumatera island. It supports the neighboring provinces demand for this commodity. The vegetable cultivation in this area is generally located around volcanoes. There are two main volcanoes in West Sumatera, Mount Marapi and Mount Talang. Several regencies were main producer such as Solok,

Tanah Datar and Agam because the fertile land of these area was affected by these mounts [2].

Agam is one of important regency in producing vegetable in West Sumatera. The vegetable are generally cultivated around Mount Marapi. For several districts, almost the majority of the population are vegetable farmers such as AmpekAngkek, Banuhampu and Sungai Pua. The cultivated vegetables are cabbages, carrot, chilli eggplant and tomato.

In vegetable cultivation, herbivore insect is serious problem. Several species of herbivore insect were reported in vegetable crop in Agam such as *Crocidolomiabinotalis, Spodoptera litura, S. frugiperda, Plutellaxylostella*and aphids. Yield lost caused by these insects reached 70% [3]. Generally, the farmers used synthetic insecticide to control the pests. However, as technology development and farmer's knowledge begins to increase, the farmers have used several alternative efforts to control the pests, including preventive effort.

One of preventive effort in controlling the pest is refugia plants use. The pest control of this way uses ecological principle, maintaining population stability in an agroecoystem or landscape so the population balance is maintained [4]. The refugia plants provide a source of food or shelter for natural enemies such as predators and parasitoids. The presence of natural enemies in an agroecoystem of landscape causes the ecosystem balance [5]. In balance ecosystem, the status of herbivore insect is not pest. The research aimetd to identify the refugia plants in vegetable crops in Agam regency.

2. MATERIAL AND METHODS

The research was conducted in vegetable plantations of Agam regency, West Sumatera and Laboratory of Weed, Faculty of Agriculture, Andalas University, Padang, West Sumatera, Indonesia. The research was conducted from May to October 2023.

2.1 Method

Purposive random sampling was used as method to determine the locations of study. The criteria of location was there was refugia plant in vegetable plantation. The area of vegetable crops was ±1 ha.According the criteria, three disctricts were chosen as sampling locations (AmpekAngkek, Banuhampu and Sungai Pua). In each district, two nagari (sub-district) were chosen to determine vegetable plantations. In each nagari, two widest area of crop Plantation were chosen as locations.

The refugia plants were collected and brought to Laboratory to identify. The identification was conducted in laboratory of Weed, Faculty of Agriculture, Andalas University, Padang, Indonesia. The species determination was conducted according morphological different.

2.2 Parameter and data analysis

The parameter was the type of refugia plants around vegetable crops in Agam regency.

3. RESULTS AND DISCUSSION

3.1 Refugia plants in vegetable crops plantation

The result showed that 12 refugia plants was found in vegetable plantations in Agam regency, West Sumatera, Indonesia (Table 1). The description of refugia plants can be seen in Figure 1. generally, the refugia plants were not well known by vegetable farmers in Agam

regency. This result was represented by the number of refugia plant in the field. However, this result also indicated that various refugia plants were planted by farmers.

Refugia was important part in an ecosystem. It played as food provider for natural enemies particularly for parasitoid. Parasitoid was as group of natural enemies that played role in herbivore insect controlling in an agroecosystem [6]. Refugia was a micro habitat that provided spacial or temporal shelter for natural enemies such as predator and parasitoid and also supporting biotic interaction components in ecosystem such as pollinator insects [7].

The result showed that 12 species of refugia plants were found in the field. Generally, the refugia plants were only planted by few farmers. This condition was caused the synthetic pesticide was still relied by farmers to control herbivore insect. From 12 refugia plant in the field, *Brassica oleracea* was the dominant species found in vegetable crops in Agam regency. generally, this plant was left by farmers after harvesting due to there were still many cultivated plants such as shallot and chili plants around *B. oleracea.* This method could be minimize energy by farmers to deliberately plant refugia plants.

Table 1. Refugia plants that found in vegetable crops in Agam regency

No	Plants	Local name
1	*Tagetes* spp.	Bunga tahiayam
2	*Cosmos* spp.	Kenikir
3	*Catharanthus roseus*	Tapakdara
4	*Melastomamalabathricum*	Sikanduduk
5	*Brassica oleracea*	Brokoli
6	*Melampodium* spp.	Melampodium kuning
7	*Helianthus annuus*	Bunga matahari
8	*Coleus scutellarioides*	Piladang
9	*Momordica charantia*	Gambas/ pario
10	*Tagetes* spp.	Bunga tahiayam
11	*Ipomoea* spp.	Bunga terompet
12	*Tagetes erecta*	Bunga tahiayam

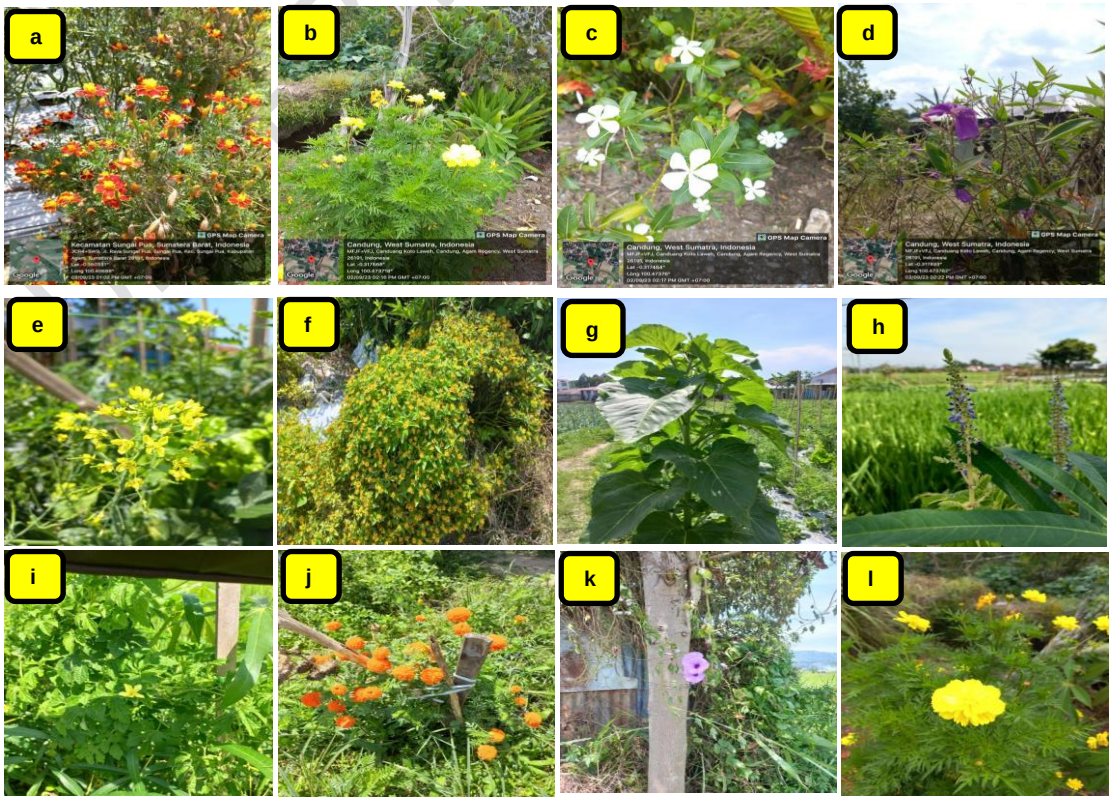

Figure 1. Refugia plants in vegetable crops of Agam regency. a) *Tagetes* spp., b) *Cosmos* spp., c) *Catharanthus roseus*, d) *Melastomamalabathricum*, e) *Brassica oleracea*, f) *Melampodium* spp., g) *Helianthus annuus*, h) *Coleus scutellarioides*, i) *Momordica charantia*, j) *Tagetes* spp., k) *Ipomoea* spp., l) *Tagetes erecta*.

Several species of refugia plant that found in field such as *Helianthus annuus, Coleus scutellarioides, Momordica charantia*dan *Ipomoea* spp. were not many planted by farmers. The purpose of these plant cultivation was not also for refugia plant. For *M. charantia*, generally this plant was planted by farmers to obtain its fruit as food and its food is typical cuisine of Minangkabau people, a majority tribe of West Sumatera. However,the small number of these plant also affected the ecosystem diversity. The *H. annuus* (sunflower) cultivation and *Cosmos* spp. was reported could increase natural enemies index. The refugia increased the availability of nectar, pollen and alternative hosts [8][9].

The study also proved that a genus of plant consisted of many species. For genus *Tagetes*, the identification result revealed that it consisted of three species (Figure 1). This result indicated that the farmers has understood about the similar plant could be used as refugia plants. Plant species from a same genus had almost similar characteristic so the plants could be substitute plant for another plants from a same genus [10].

According to the result, the vegetable farmers of Agam regency had understood about Intergrated Pest Management (IPM) to control herbivore insect. The benefits of refugia plants were micro habitat for natural enemies, nectar source for pollinator insect and a balance agroecosystem. The balance ecosystem is highly related to the herbivore insect as a pest. A balance ecosystem caused the insect herbivore status was also as herbivore.

4. CONCLUSION

12 refugia plants were found in vegetable crops in Agam regency, *Tagetes* spp., *Cosmos* spp., *Catharanthus roseus*, *Melastomamalabathricum*, *Brassica oleracea*, *Melampodium* spp., *Helianthus annuus*, *Coleus scutellarioides*, *Momordica charantia*, *Tagetes* spp., *Ipomoea* spp. dan *Tagetes erecta*.

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